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TRUCKING AND SIZE AND WEIGHT REGULATIONS IN THE MID-CONTINENT CORRIDOR

Master of Science Thesis

by

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THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

MASTER'S THESIS/PRACTICUM FINAL REPORT

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Trucking and Size and Weight Regulations in the Mid-Continent Corridor.

submitted by

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The Thesis/Practicum Examining Committee certifies that the thesis/practicum (and oral examination if required) is:

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TRUCKING AND SIZE AND WEIGHT REGULATIONS IN THE MID-CONTINENT CORRIDOR

by

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A Thesis
Submitted to the Faculty of Graduate Studies
in Partial Fulfilment of the Requirements
for the Degree of

MASTER OF SCIENCE

Department of Civil and Geological Engineering
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Abstract

This thesis is an empirical analysis of trucking and truck size and weight (TS&W) regulations in the Mid-continent corridor. Based on this analysis, it compares and contrasts plausible near term TS&W policy options relating to this corridor.

The approach of the research is to understand the corridor's TS&W regulations, trucking activity, and commodity and trade flows; with a view to facilitating the comparing and contrasting of TS&W policy options. With this understanding, the thesis then compares and contrasts the TS&W policy options.

The corridor is governed by a complex set of TS&W regulations emanating directly from the U.S. Federal Government, the nine corridor States, Mexico, Manitoba, and indirectly from other jurisdictions throughout North America. This regulatory environment includes important differences on limits concerning tire loads, axle loads, gross vehicle weights, Bridge Formula requirements, vehicle heights, vehicle widths, semitrailer lengths, vehicle combination lengths, and large truck configurations. These TS&W regulations have created a complex truck fleet with many different physical and operational characteristics. This fleet includes vehicles designed for "go anywhere" trucking to many types of special vehicles with unique body types, axle arrangements, and tire arrangements designed to optimize operations for specific commodities, origin-destination pairs, and truck routings.

The total activity in the corridor is dominated by intrajurisdictional movements. However, while the corridor is often characterized as a north-south entity, much of its transportation activity in fact runs east-west to and from or through the corridor States. Also, the amount of interstate trucking that occurs within the corridor is minimal and very little north-south interjurisdictional activity takes place to and from the corridor.

Most sections of the corridor involve low to medium truck volumes, while some involve very high volumes. The lowest truck volumes along the corridor occur at its ends--south of the Manitoba-U.S. border, between Minneapolis and Duluth, between Laredo and Cotulla--and in its middle on the east side of Wichita, Kansas.

Much of the trucking in this corridor takes place well within the boundary conditions established by the TS&W regulations governing trucking in the corridor. Therefore, relaxation of these regulations can only be of real consequence in the near to medium term to mainly selected aspects of the total trucking activity.

Many of the detailed regulatory differences that exist today relating to trucking in the Mid-continent corridor cannot be justified with any technical argument. There is good reason to pursue the harmonization and rationalization of TS&W regulatory differences of little or no technical significance to facilitate safer and more efficient trucking in the corridor.

Acknowledgments

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1.0 Introduction

1.1 The Thesis

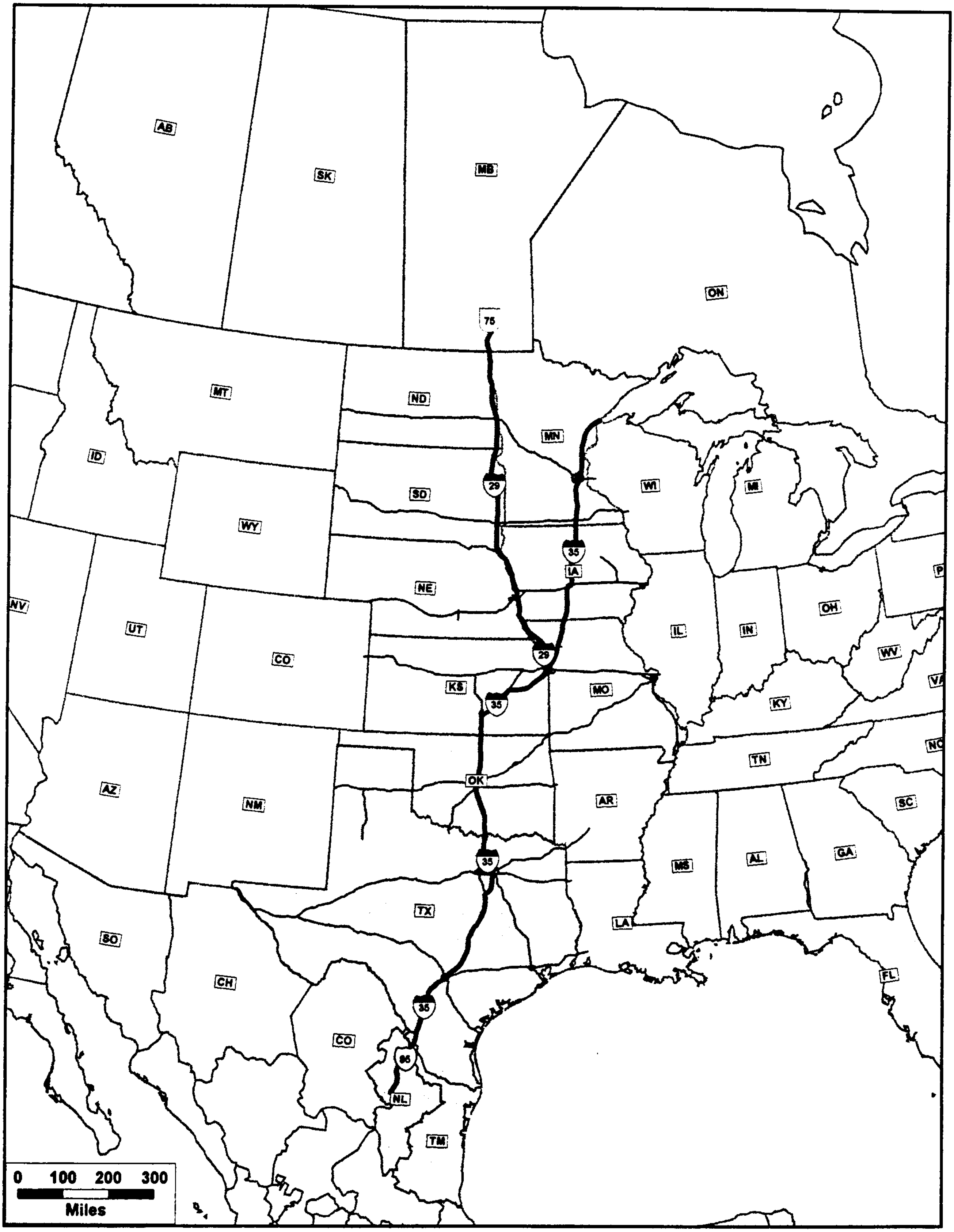
This thesis is an empirical analysis of trucking and truck size and weight (TS&W) regulations in the Mid-continent corridor. Based on this analysis, it compares and contrasts plausible near term TS&W policy options relating to this corridor.

1.2 Background

The Mid-continent corridor (I-29/I-35) is an important north-south link in the United States. The I-35 component of the corridor has been recently designated as a high priority corridor under an amendment to Section 1105 (c) of the Intermodal Surface Transportation Efficiency Act of 1991. [Ref. 1].

The spine of the corridor in the United States is defined by the I-35 and I-29. The I-35 runs between the Great Lakes port city of Duluth, Minnesota--through Minnesota, Iowa, Missouri, Kansas, Oklahoma, and Texas--to Laredo, Texas and the port of entry to Mexico. The I-29 runs between the border city of Pembina, North Dakota, at the U.S.-Manitoba border--through North Dakota, South Dakota, Iowa (along the Iowa-Nebraska border, adjacent to Nebraska) and Missouri--to Kansas City, Missouri, where it joins I-35. Other major highway links in this corridor are: (1) Provincial Trunk Highway 75 (PTH 75), which runs between Winnipeg, Manitoba and Emerson, Manitoba at the U.S.-Canada border; and (2) the segment of Mexican Federal Highway 85 (MX-85) that runs from the U.S.-Mexico border at Laredo, Texas to the Mexican city of Monterrey, Nuevo León. For the purposes of this research, the corridor is considered the Mid-continent corridor States, the Province of Manitoba and the Mexican States of Nuevo León and Tamaulipas. The corridor is illustrated in Figure 1-1.

Figure 1-1
Mid-Continent Corridor Study Area



Source: NHPN GIS Data, 1995

Pembina-Emerson is the major U.S.-Canada crossing in the corridor. It has the second highest truck volume moving across the western U.S.-Canada border, averaging a two-way traffic of 739 trucks per day in 1995. [Ref. 2]. Laredo-Nuevo Laredo is the major U.S.-Mexico crossing in the corridor. It has the highest volume crossing on the U.S.-Mexico border, averaging a two-way traffic of 4,020 trucks per day in 1995. [Ref. 3].

There are two on-going international investigations concerning TS&W policy that could affect the corridor. These are: (1) the Department of Transportation Comprehensive Truck Size and Weight Study in the U.S.; and (2) negotiations under the Land Transportation Standards Subcommittee on Vehicle Weights and Dimensions under the NAFTA.

Understanding truck activity and freight movement in the Mid-continent corridor is necessary for evaluating the effects of the TS&W policy options under consideration. This research develops this understanding and considers these options with a view to assisting decision makers address policy questions from the perspective of this corridor.

1.3 Objectives and Scope

The objectives and scope of this research are defined by the following questions:

1. What are the TS&W regulations that govern trucking in this corridor? Consideration is given to State laws of the States in the corridor, other States' laws, the U.S. Federal law, the Federal law of Mexico, the provincial law of Manitoba.

2. What types and quantity of trucking operate in the corridor, and how do they relate to TS&W regulations? Considerations of interest are truck volumes, fleet mixes, truck usage, and vehicle characteristics.

3. What are the origin-destination (O-D) patterns of trucks that move in the corridor; what are the commodities moved, in what quantities; and how can these O-Ds and commodities be related to TS&W policy options? Considerations of interest are commodity and trade flows between and to/from the corridor States, between Canada and the corridor, and between Mexico and the corridor.

4. What are the plausible, near term TS&W policy options that could affect trucking in the corridor, and what are the nature and magnitude of their possible effects?

The TS&W policy options considered are:

In the United States--Federal TS&W options

1. Status Quo
2. Expanded Federal Control on the National Highway System
3. State Flexibility
4. International Considerations
5. TS&W Limits Rollback

In the NAFTA

1. Limiting discussions to the NAFTA options which would comfortably fit within the current basic U.S. Federal TS&W limits as they apply to 5- and 6-axle combinations.

2. Encouraging national governments to support on-going local and regional discussions of TS&W options.

Canada and Mexico Related

1. Canadian and Mexican accommodation of important differences with U.S. TS&W policy.

1.4 Relevance of the Research

TS&W regulations greatly influence the types of trucks that move on a highway, and the impact of those vehicles on the infrastructure, the economy, the environment, and highway safety. [Ref. 4, p 11]. The types of trucks resulting from different TS&W regulations determine aspects such as pavement costs, design requirements and deterioration rate of infrastructure, intermodal operations, stability and control, and other engineering-related items. TS&W regulations also have an effect on truck/rail competition, logistical costs of industries, and traffic operations.

Typically, trucks operate under a composite of conflicting TS&W limits emanating from the combination of local, State, and/or Federal regulations governing the highways on which these trucks operate (in the case of international movements, Canadian provincial laws and the Mexican Federal law also apply). A truck manufacturer or truck operator confronted with multiple TS&W regulations and interested in operating at one or another or all of the limits specified by these regulations has three choices: (1) to select a "least common denominator" vehicle and operating strategy; (2) to select a vehicle or operating practice which can be modified en-route as needed (for example, remove a trailer, reduce the load, move an axle); or (3) to attempt to circumvent the law. [Ref. 4, p 11].

1.5 Approach and Organization

This research involves four steps:

1. Understanding the TS&W regulations in the corridor.
2. Understanding trucking activity in the corridor.
3. Understanding commodity and trade flows in the corridor.
4. Defining, comparing and contrasting plausible near term TS&W policy options relating to the corridor.

Chapter 2 is directed at the understanding of the transportation system, and most particularly, the TS&W regulations in the corridor, with a view to facilitating the comparing and contrasting of TS&W policy options. The Mid-continent corridor is governed by a very complex set of regulations including the U.S. Federal law, regulations of the nine States in the corridor, provincial regulations of Manitoba, and the Mexican Federal law. The chapter: (1) characterizes the road network in the corridor; (2) details and explains current TS&W provisions governing regular operations in Manitoba, in the corridor States and in Mexico; and (3) summarizes the transportation system to facilitate the comparing and contrasting of plausible near term TS&W policy options.

Chapter 3 is directed at the understanding of trucking activity in the corridor, with a view to facilitating the comparing and contrasting of TS&W policy options. To achieve this, it is necessary to understand truck volumes, fleet mixes, operational characteristics, and characteristics of vehicles that move in the corridor. The chapter: (1) examines Truck Inventory and Use Survey (TIUS) data regarding fleet make-up, commodity handlings, operating range, and truck weight characteristics in the corridor States; (2) presents truck flow data; (3) examines State-based vehicle classification data along the I-29 and I-35; (4) discusses fleet characteristics based on five field surveys (State classification data; the Emerson Scale survey, conducted between February and August, 1996; on-road truck classification surveys conducted along I-29 and I-35 between April and August, 1996; the Manitoba-based truck load carrier survey, conducted in October, 1996; and a truck classification survey conducted by the Mexican Transportation Institute on Mexican highways); (5) illustrates how the regulations work to affect vehicle characteristics; and (6) summarizes the trucking activity in the corridor to facilitate the comparing and contrasting of plausible near term TS&W policy options.

Chapter 4 is directed at the understanding of commodity and trade flows in the corridor, with a view to facilitating the comparing and contrasting of TS&W policy options. It is necessary to understand freight movements in the corridor in terms of quantities and types of commodities, origin-destination patterns, weight and value of commodities moved, and routing. The chapter: (1) examines commodity and trade flows in the study area using six data sources: (a) the Transearch Database; (b) the 1993 Commodity Flow Survey (by State of origin); (c) Statistics Canada; (d) the Emerson Scale Survey; (e) the Manitoba-based truck load carrier survey; and (e) the 1994 Transborder Surface Freight Transportation Database; and (2) summarizes information related to commodity and trade flows to facilitate the comparing and contrasting of plausible near term TS&W policy options.

Chapter 5 defines, and compares and contrasts, plausible near term TS&W policy options relating to trucking in the Mid-continent corridor.

Chapter 6 presents conclusions and suggestions for further research.

1.6 Thesis Terminology

During the course of this thesis, the following terminology will be used:

- *Interstate System (IS)*: It is the National System of Interstate and Defense Highways described in sections 103 (e) and 139 (a) of Title 23, U.S.C. [Ref. 5, p 284]. Federal law governs TS&W regulations of vehicles of the Interstate System. [Ref. 6, p 9].

- *National Network (NN)*: It is a specially designated set of highways on which the TS&W provisions of the Surface Transportation Assistance Act (STAA) of 1982 apply (102-inch maximum vehicle width, 48-foot minimum semitrailer length, 28-foot minimum trailer length, and 80,000 pounds maximum gross vehicle weight). This system includes all IS highways and designated Federal-aid primary highways. [Ref. 6, p 9].

- *National Highway System (NHS)*: It is a specially designated set of highways approved by Congress in 1995. It includes all IS highways and some NN highways. [Ref. 7, p 4]. As distinct from the NN highways, not all NHS highways are truck routes.

- *Longer Combination Vehicle (LCV)*: It is any combination of a truck tractor and two or more trailers or semitrailers which operates on the Interstate System at a gross vehicle weight greater than 80,000 pounds. [Ref. 5, p 284].

- *Commercial Motor Vehicle (CMV)*: It is a motor vehicle designed or regularly used for carrying freight, merchandise, or more than ten passengers, whether loaded or empty, including buses, but not including vehicles used for vanpools. [Ref. 5, p 284].

- *Outer Bridge*: Is represented by the distance between the two extreme axles in a vehicle. For example, in a 5-axle tractor semitrailer, the outer bridge is the distance from the steering axle to the rear axle in the trailer tandem group.

- *Inner Bridge*: Is represented by the distance between two extreme axles in any axle group. For example, in a 5-axle tractor semitrailer, there are a number of inner bridges. One example is the distance from the front of the drive tandem to the rear of the trailer tandem.

- *Average Annual Daily Truck Traffic (AADTT)*: Is the number of trucks passing a point on an average day of the year. [Ref. 8, p 1].

References for Chapter 1

[1] Amendment to Section 1105 (c) of the Intermodal Surface Transportation Efficiency Act of 1991. Public Law 104-59, November 28, 1995.

[2] Clayton, Alan and Blow, Phil. "Western U.S.-Canada Crossborder Case Study" (Report No. 5). U.S. DOT Comprehensive Truck Size and Weight Study. Washington, D.C. December, 1995.

[3] Montufar, Jeannette and Clayton, Alan. "United States-Mexico Crossborder Case Study" (Report No. 9). U.S. DOT Comprehensive Truck Size and Weight Study, Washington, D.C. November, 1996.

[4] Clayton, Alan, Blow, Phil and Ritchey, Ben. "Synthesis of Truck Size and Weight Studies and Issues" (Report No. 1). U.S. DOT Comprehensive Truck Size and Weight Study. Washington, D.C. March, 1995.

[5] Code of Federal Regulations Title 23. April, 1995.

[6] McNally, Rand. Motor Carriers' Road Atlas. 1997.

[7] Slater, Rodney. "The National Highway System: A Commitment to America's Future". Public Roads (pp 3-6). Spring, 1996.

[8] University of Manitoba Transport Information Group (UMTIG). "Truck Traffic on Manitoba Highways, 1994". December, 1995.

2.0 Transportation System

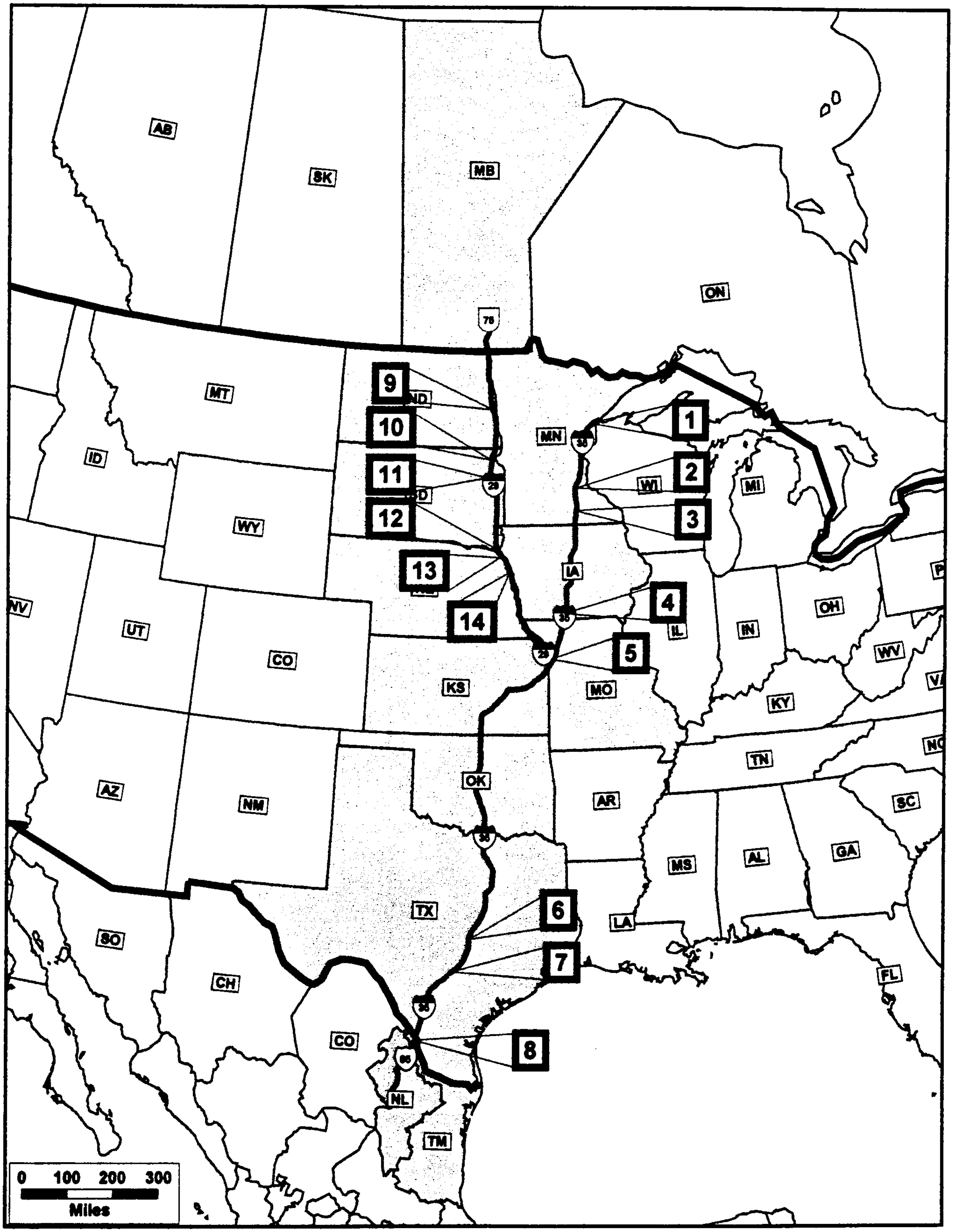
This chapter is directed at understanding the transportation system, and most particularly, the TS&W regulations in the corridor, with a view to facilitating the comparing and contrasting of TS&W policy options. The chapter characterizes the road network and details and explains current TS&W provisions governing regular operations in the corridor.

2.1 Road Network

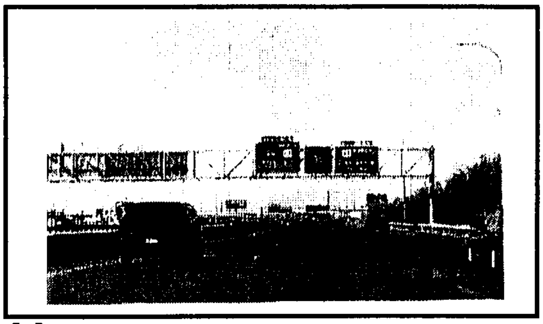
Figure 2-1 and the photos in the following pages illustrate highway characteristics of the corridor. Both I-29 and I-35 range from rural, low-volume highways to urban, low-volume and urban, high-volume. In some cases, these highways become very high volume, as is the case of I-35 through Dallas, Texas. Interstate 35 also becomes a depressed freeway through downtown Austin, Texas. At Laredo, I-35 is a congested highway that terminates in downtown Laredo, Texas at the U.S.-Mexico border. Trucks coming from Mexico can enter Laredo and continue the trip on other State highways before entering the I-35.

Major components of the road network serving the nine corridor States, Manitoba and Mexico are shown in Figure 2-1-a. This network consists of all U.S. Interstate System (IS) highways, National Highway System (NHS) highways, National Network (NN) highways, Manitoba Provincial Trunk Highways (PTH), and Mexican type A and type B Federal Highways. Mexican type A highways are four-lane divided highways with some sections that are two-lane undivided. Type B highways are two-lane undivided with some sections that are four-lane undivided. Figure A-1 in Appendix A shows the IS highways, Figure A-2 shows the NHS highways, Figure A-3 shows the NN highways, Figure A-4 shows the NN highways which are not NHS, and Figure A-5 shows the NHS highways which are not NN.

Figure 2-1
Highway Characteristics in the Mid-Continent Corridor



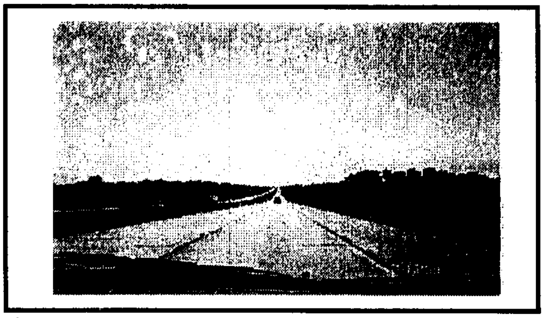
Source: University of Manitoba Transport Information Group



[1] Southbound direction--start of I-35
Duluth, Minnesota

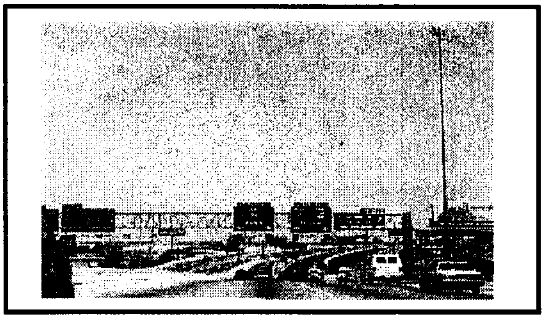
[2] Northbound direction--just south
of Minneapolis, Minnesota

[3] Southbound direction--between
Minneapolis and Water Town, MN

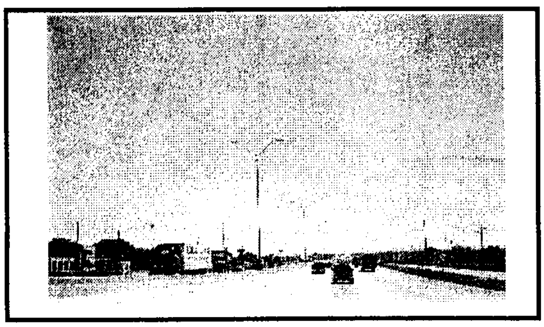


[4] Northbound direction--just north of
the Iowa/Missouri border

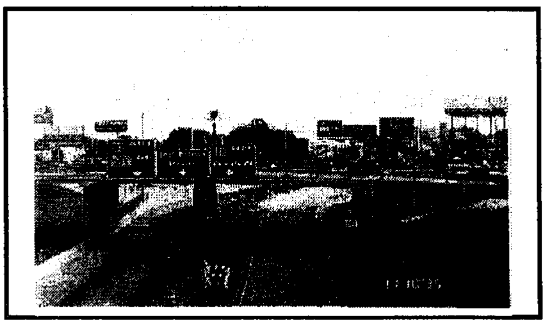
[5] Northbound direction--entering
Kansas City, Missouri



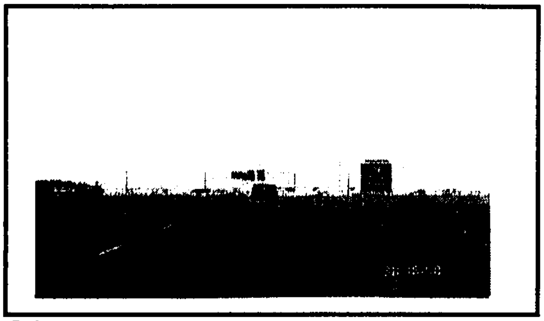
[6] Northbound direction
San Antonio, Texas



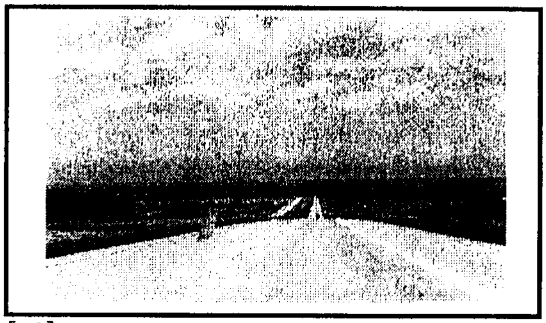
[7] Southbound direction--Austin, TX



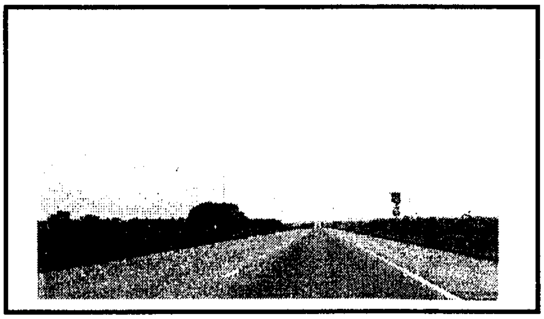
[8] Southbound direction--end of I-35
Laredo, Texas at U.S.-Mexico border



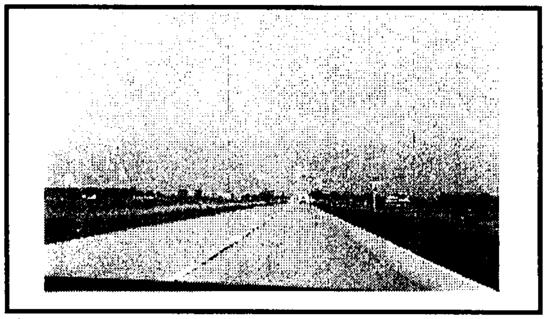
[9] Northbound direction--just south of Fargo, North Dakota



[10] Northbound direction--about 30 miles south of the ND/SD border



[11] Southbound direction--just north of Water Town, South Dakota



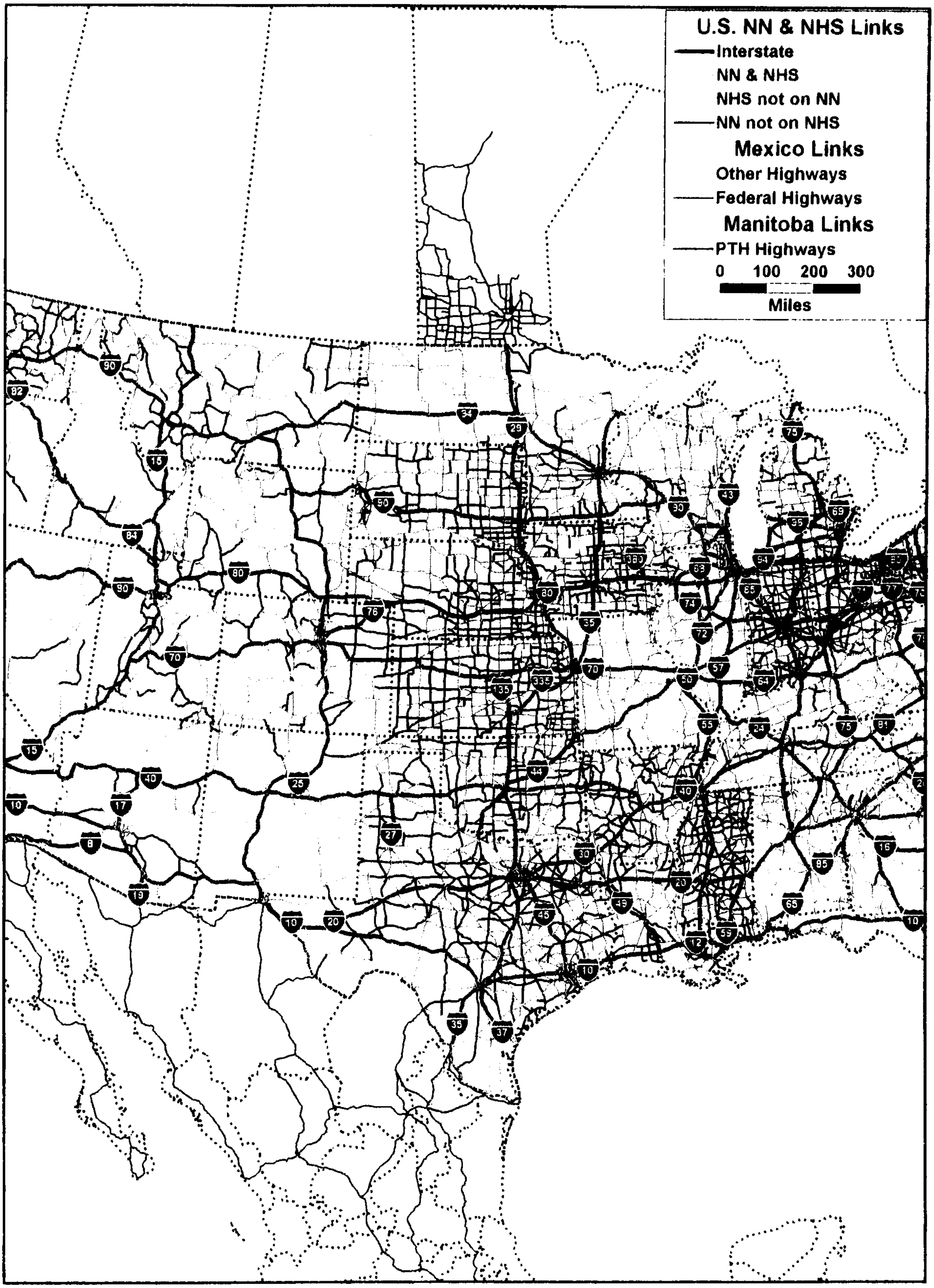
[12] Northbound direction--between the ND/SD border and Sioux City, IA

[13] Northbound direction--just south of Sioux City, Iowa

[14] Northbound direction--between Omaha, NE and Sioux City, IA

Figure 2-1-a

Road Network in the Study Region



Source: NHPN GIS Data, 1995 and UMTIG

Table 2-1 summarizes the mileage in each of the components of the road network being considered in this research. There are 9,607 miles of IS highways in the corridor States (21 percent of the national IS network). Also in the corridor States there are: (1) 29,503 miles of NHS highways which are not IS highways; (2) 6,894 miles of NHS highways which are not IS or NN highways; and (3) 31,493 miles of NN highways which are not NHS or IS highways. Understanding the U.S. road system in terms of IS, NHS and NN is necessary because the TS&W policy options are network dependent. For example, an option which is NHS-specific, affects a higher percentage of the mileage in Missouri than in other States in the corridor. Likewise, an option which is NN-specific has a lower impact in Missouri than in other corridor States (except for North Dakota).

Table 2-1
Highway Mileage in the U.S. Road Network Under Consideration
(Data based on the "miles" data column from the NHPN GIS Database)

State	Interstate Highways	Highways on both NN and NHS (which include IS)	Highways on NHS but not NN	Highways on NN but not NHS
North Dakota	572	1,477	674	134
South Dakota	677	2,216	15	3,564
Nebraska	478	2,373	149	4,749
Minnesota	910	3,150	793	1,670
Iowa	783	2,921	277	3,645
Missouri	1,163	3,315	1,186	263
Kansas	859	3,593	178	5,193
Oklahoma	928	2,833	368	3,292
Texas	3,237	10,338	3,254	8,983
U.S.	45,074	111,644	49,629	65,478

2.2 TS&W Regulations Governing Regular Operations in the Corridor

The Mid-continent corridor is governed by a very complex set of regulations including the

U.S. Federal law, regulations of the nine States in the corridor, provincial regulations of Manitoba, and the Mexican Federal Law. This section details and explains the TS&W regulations in the corridor States, Manitoba and Mexico, with a view to facilitating the comparing and contrasting of TS&W policy options.

2.2.1 Legislative Framework

A combination of TS&W laws and regulations govern trucking operations along the corridor, across the Canada-U.S. border, and across the U.S.-Mexico border. The most important are: (1) provisions of the Intermodal Surface Transportation Efficiency Act (ISTEA) freeze applicable to the nine corridor States of North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Missouri, Kansas, Oklahoma and Texas; (2) the TS&W law of the nine States in the corridor; (3) other aspects of the Federal TS&W law; (4) the TS&W law of Manitoba; and (5) the Mexican Federal TS&W law. In addition, TS&W regulations from throughout the country, also influence trucking in the corridor States because of: (1) the extensive transportation linkages of corridor States with adjacent States and the rest of the country; and (2) the movements of commodities between the west and east through the corridor States.

2.2.2 Regulation Details in the Corridor States

Table 2-2 presents selected aspects of the de facto TS&W provisions governing trucking operations on highways in the corridor States. The provisions shown in Table 2-2 are a mixture of Federal and State laws and regulations. They are de facto in that they represent the regulatory limits within which trucks can operate legally by registering the vehicle or obtaining necessary "across-the-counter" permits. Sometimes, some trucks operate beyond these de facto limits--either under special permit or illegally. There are other regulatory details over and above those shown in Table 2-2 which influence trucking operations in this corridor.

Table 2-2

TS&W Regulations in the Corridor States

(dimensions in feet and weights in 1000s of pounds)

	WASHTO	North Dakota+			South Dakota			Nebraska			Minnesota+			Iowa			Missouri			Kansas			Oklahoma			Texas		
		IS	NN	Oth	IS	NN	Oth	IS	NN	Oth	IS	NN	Oth	IS	NN	Oth	IS	NN	Oth	IS	NN	Oth	IS	NN	Oth	IS	NN	Oth
Width	8.5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	8.0	•	•	•	•	•	•	•	•	•
Height	14	•	•	•	•	•	•	14.5	14.5	14.5	13.5	13.5	13.5	13.5	13.5	13.5	•	•	13.5	•	•	•	13.5	13.5	13.5	•	•	•
Max Length																												
Single Unit	45	50	50	50	•	•	•	40	40	40	40s	40s	40s	40	40	40	40	40	40	42.5	42.5	42.5	•	•	•	•	•	•
Semi-trailer	48	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	NR	59.5	59.5	59.5	59.5	59.5	53	59	59	59
Kingpin Setting	NA	•	•	•	•	•	•	•	•	•	41 KCRT	41 KCRT	41 KCRT	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Trailer	NR	53	53	53	45	45	45	40	40	40	45	45	45	28.5	28.5	28.5	•	•	•	28.5	28.5	28.5	29	29	29	•	•	•
Doubles Box-length	61	NR	NR	NR	81.5	81.5	81.5	65	65	65	2x28.5	2x28.5	NA	2x28.5	2x28.5	2x28.5	2x28	2x28		2x28.5	2x28.5	2x28.5	2x29	2x29	2x29	2x28.5	2x28.5	2x28.5
Truck-Trailer	70	75	75	75	80	80	80	65	65	65	NR	NR	NR	65	65	65	65	65	55	65	65	65		•	•	65	65	65
Tractor-semi	65	NR	NR	75	NR	NR	NR	NR	NR	NR	NR	NR	•	NR	NR	60	NR	NR	60	NR	NR	NR		NR	NR	NR	NR	NR
Trac+double	NR	•	•	75	•	•	•				•	•	NA	NR	NR	60	NR	NR	65	•	•	•				NR	NR	NR
ISTEA CMV (2)		103	103	na	100	100	na	95	95	na	No	No	No	No	No	No	109	na	na	109	na	na	110	110	na	No	No	na
ISTEA CMV (3)		100	100	na	100	100	na	95	95	na	No	No	No	No	No	No	109	na	na	109	na	na	95	95	na	No	No	na
Tire Weight (lbs/in)																												
Steering	600	550	550	550	•	•	•				•	•	•	TR	TR	TR	NR	NR	NR	•	•	•	na	na	na	650	650	650
Other	500	550	550	550	600	600	600				•	•	•	TR	TR	TR	NR	NR	NR	575	575	575	na	na	na	650	650	650
Axle weight																												
Steering	20	12.1	12.1	12.1	•	•	•	•	•	•	•	•	•	•	•	•	•	22	22	•	•	•	•	•	•	•	•	•
Single	20	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	22	22	•	•	•	•	•	•	•	•	•
Tandem	34	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36	36	•	•	•	•	•	•	•	•	•
Tridem	BFB	•	48	48	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Gross Weight	80	105	105	105	•	•	•	•	95	95	•	•	•	•	•	•	•	•	•	•	85.5	85.5	•	90^^	90^^	•	84^^	84^^
f FHWA-14 no permit		80	105	105	80	129	129	80	95	95	80	80	80	80	80	80	80**	80**	80**	80	85.5	85.5	80	90	90	80	84	84
f FHWA-14 r, permit 5-axle		103s	103s	103s	116s	116s	116s	99s	99s	99s	92s	92s	92s	100s	100s	100s	92s	92s	92s	95s	95s	95s	95s	95s	95s	106.1	106.1	106.1
f FHWA-14 r, permit >5-axle		136s	136s	136s	sc	sc	sc	110s	110s	110s	144s	144s	144s	160s	160s	160s	120s	120s	120s	120s	120s	120s	140s	140s	140s	200	200	200
i ISTEA LCV (2)		105	na	na	129	na	na	95	na	na	na	na	na	na	na	na	120	na	na	120^	na	na	90	na	na	na	na	na
i ISTEA LCV (3)		105	na	na	129	na	na	0++	na	na	na	na	na	na	na	na	120	na	na	120^	na	na	90	na	na	na	na	na
BRIDGE FORMULA B		Yes	Out	Out	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Mod	Yes	Yes	Mod	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Mod	Yes	Mod	Mod

SOURCES

Guide for Uniform Laws and Regulations Governing TS&W Among the WASHTO States. July 1995, UNLESS NOTED OTHERWISE

Code of Federal Regulations. April, 1995

f - FHWA Working Paper # 14: GVWs by routine permit are from s and considered "approximate"

s - Specialized Carriers and Rigging Association Pemit Manual

o - Other source data corrected by State official

r - Rand-McNally Motor Carrier Atlas

NP no provisions

NA not allowed

na not applicable

sc a determination is made on a case-by-case basis

TR Tire Rating

IS Interstate System highway

NN National Network highway

Oth highway other than IS or NN highways

NOTES

* same as WASHTO

** these GVWs are different in commercial zones in Missouri

++ a truck tractor and 3 trailing unit combination is required to travel empty

NR not regulated

BFB Bridge Formula B

KCRT Kingpin to center of rear tandem

ISTEA CMV (2) combination with two cargo units

ISTEA CMV (3) combination with three cargo units

ISTEA LCV (2) tractor with two trailing units

ISTEA LCV (3) tractor with three trailing units

^^ In Texas, a 5 percent GVW tolerance policy annual permit is readily available for any vehicle which is otherwise registered for 80,000 pounds GVW and is capable of operating at the higher GVW authorized by the permit (80,000 * 1.05 = 84,000 pounds). Within the specially permitted GVW limit of 84,000 pounds, a 10 percent tolerance on individual axle weights (i.e. 34,000 pounds on a tandem*1.10=37,400 pounds) is also allowed. (Texas officials advise that about 15,000 of these permits were issued in 1995--about 25 percent of the Texas 5+ axle fleet).

^^ In Oklahoma, the maximum allowable GVW on IS highways is 80,000 pounds, except for truck-tractors with 2 and 3 trailing units for which it is 90,000 pounds. On non-IS highways, the maximum allowable GVW is 85,500 pounds for 5-axle trucks and 90,000 pounds for 6-axle trucks.

\+ Minnesota and North Dakota allow a 10 percent weight increase in winter months

^ on Kansas Turnpike and access roads. Other limits apply on the I-70 between the Kansas-Colorado border and Goodland

North Dakota [Ref. 1, p.18]

The North Dakota limits specified by the ISTEA freeze for double-trailer combinations are 105,500 pounds GVW and a cargo-carrying length of 103 feet (cargo-carrying length is the distance from the start of the first trailer to the end of the last trailer, including connections). The triple-trailer combination limits are 105,500 pounds GVW, and a box length of 100 feet. Permits are required to operate at more than 80,000 pounds GVW on IS highways. These permits are obtained across the counter for a fee. Figure 2-2 illustrates the maximum specified GVW on NHS highways in North Dakota and the other corridor States, on the PTH system in Manitoba, and on Federal Highways in Mexico.

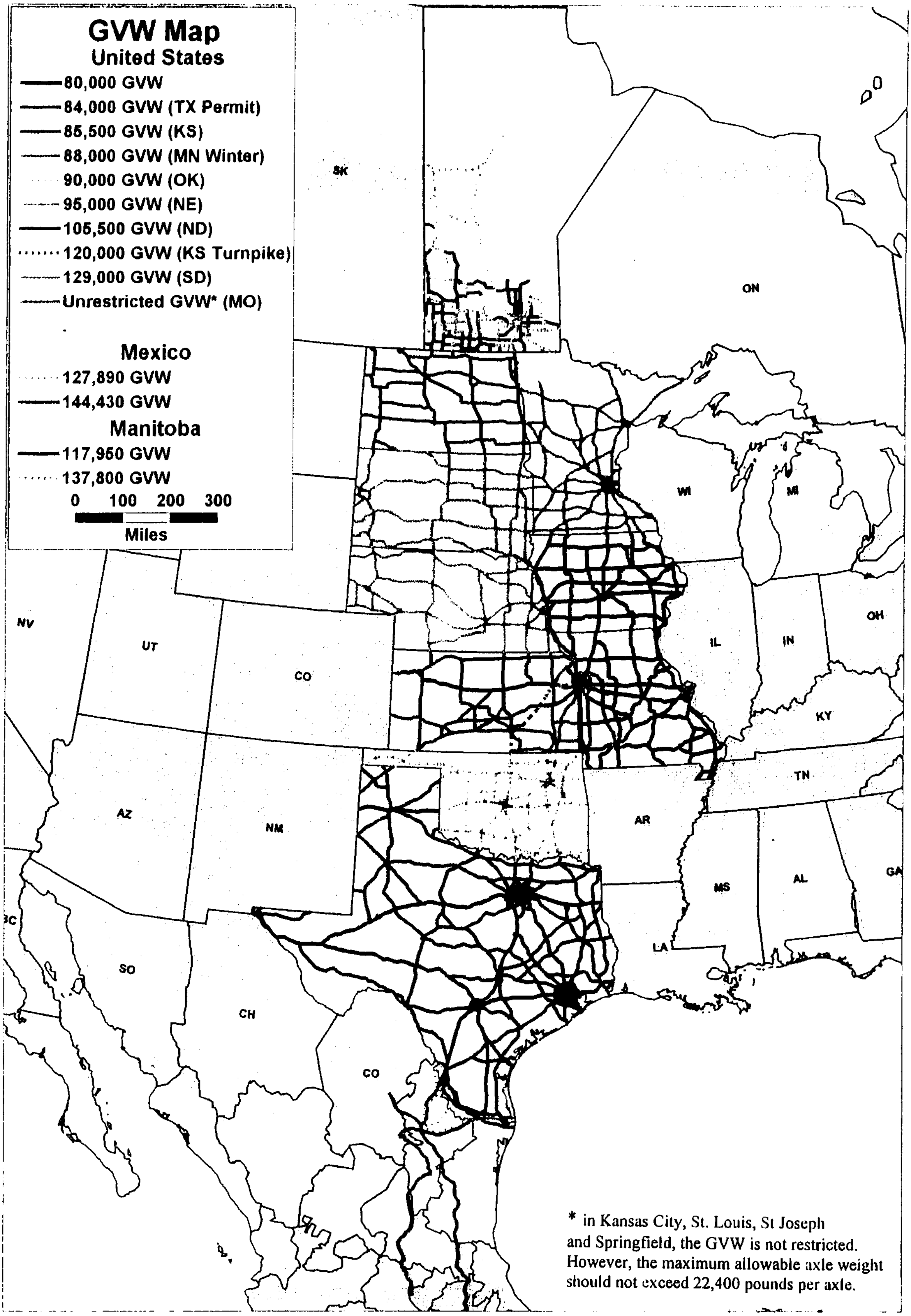
Double-trailer combinations at up to 105,500 pounds GVW operate in North Dakota, and in crossborder trucking. These combinations are typically used for truckload hauling of special commodities such as grain and fertilizer (using hopper bottom trailers), fuel (in tankers), dry bulk materials (such as cement), and flatbed trailer operations.

North Dakota does not require trucks to comply with the inner bridge requirements of Bridge Formula B on non-IS highways. However, the inner bridge requirements are enforced on IS highways. Outer bridge requirements must be met in both cases. On non-IS highways, North Dakota allows 48,000 pounds on tridem axles (irrespective of the spacing), without reference to Bridge Formula B. Tridems on IS highways are limited by Bridge Formula B.

By axle weights, a six-axle tractor-semitrailer is theoretically permitted 94,000 pounds GVW on non-IS highways in North Dakota (an effective 12,000-pound weight on the steering axle, 34,000 pounds on the drive tandem axle, and 48,000 pounds on the trailer tridem axle). In practice, such a combination would normally gross at about 89,500 pounds because of the Bridge Formula B limitations and the practical outer axle spacing. Six-axle tractor-semitrailers regularly operate on North Dakota IS highways at 88,000 to 89,500 pounds GVW using routine permits and in full compliance with the Bridge Formula.

Figure 2-2

Maximum Specified GVW on NHS Highways in the Corridor States, on the PTH System in Manitoba and on Federal Highways in Mexico



Source: Individual State and Provincial Regulations, FHWA Working Paper No. 14, Code of Federal Regulations, and Mexican Regulations

Bridge Formula B limitations, however, encourage North Dakota trucking to utilize five-axle tractor-semitrailers with 10-foot split tandems. These configurations can operate at GVWs of up to 86,000 pounds rather than six-axle tractor semitrailers at 88,000 to 89,500 pounds GVW. This is because the extra tare weight of the six-axle unit is about 3,000 pounds, leaving it a payload capacity more or less the same as a five-axle unit with a split tandem.

In winter months, North Dakota allows a 10 percent weight increase on non-IS highways. This 10 percent increase applies to tire weights, axle weights, GVW limits, and Bridge Formula limitations. [Ref. 2]. For example, a 5-axle tractor-semitrailer operating on the Interstate is restricted to 80,000 pounds throughout the year. When this truck is operating off the Interstate in winter months, it is allowed a maximum GVW of 88,000 pounds. A 6-axle tractor-semitrailer operating off the Interstate in the winter can increase the weight on the tridem group from 48,000 pounds to 52,800 pounds. This 10 percent winter weight allowance caps at 105,500 pounds. Thus, a B-train operating off the IS in the winter cannot increase its GVW from 105,500 pounds to 116,000 due to the cap.

South Dakota

The limits specified by the ISTEA freeze for a truck tractor and 2 trailing units are: [Ref. 4, p 343]

- Maximum GVW of 129,000 pounds.
- Cargo-carrying length of 100 feet (cargo-carrying length is the distance from the front of the first trailer to the rear of the last trailer).
- For combinations with a cargo-carrying length over 81.5 feet, neither trailer may exceed 48 feet, including load overhang, and a readily available single-trip permit is required for all movements. These combinations are restricted to operate on IS highways and a number of designated NN highways.

- For combinations with a cargo-carrying length of 81.5 feet or less, a readily available single-trip permit is required for movement on IS highways if the GVW exceeds 80,000 pounds. These combinations are allowed to operate on all NN routes.

The limits specified by the ISTEA freeze for a truck tractor and 3 trailing units are: [Ref. 4, p 345]

- Maximum GVW of 129,000 pounds.

- Cargo-carrying length of 100 feet. The overall length of the unit is restricted to 110 feet and the trailer lengths are limited to 28.5 feet, including load overhang.

The ISTEA freeze specifies that for truck tractors with 2 or 3 trailing units, the maximum gross weight on two or more consecutive axles is limited by Bridge Formula B. Axle weights are restricted as follows: (1) 20,000 pounds on single axles or tandem axles spaced 40 inches or less apart; and (2) 34,000 pounds on tandem axles spaced more than 40 inches apart. The weight on the steering axle may not exceed 600 pounds per inch of tire width. If the combination has a cargo-carrying length greater than 81.5 feet, the weight on all axles (other than the steering axle) may not exceed 500 pounds per inch of tire width. [Ref. 4, p 343-344].

South Dakota statutes indicate that the State applies a special bridge formula to operations on both IS and non-IS highways and requires compliance with the formula from both the inner and outer bridge perspectives. This bridge formula has minor differences with Bridge Formula B. There is no difference between the two formulas for 2-, 4-, 6- and 8-axle trucks. Minor differences (500 pounds GVW) exist for: (1) 3-axle trucks at 9-, 11- and 13-foot spreads; (2) 5-axle trucks at 22-, 30-, 34-, 38-, 42-, 46- and 50-foot spreads; and (3) 7-axle trucks at 27-foot spreads.

The maximum allowable vehicle weight on IS and non-IS highways in South Dakota is 129,000 pounds. A self-issuing single-trip permit is available which allows a motor vehicle to exceed 80,000 pounds when traveling on IS highways. [Ref. 3, p 20]. The vehicle has to comply with the South Dakota Bridge Formula and with axle and tire weight requirements.

South Dakota does not regulate kingpin settings or the overall length of a tractor-semitrailer. The maximum allowable length of a semitrailer is 53 feet on NN and non-NN highways. Figure 2-3 shows maximum specified semitrailer lengths on NHS highways in South Dakota and other corridor States. South Dakota does not regulate the overall length of a tractor-double trailer combination, but does restrict the length of the cargo-carrying unit to a maximum of 81.5 feet with each of the individual trailers not to exceed 45 feet. [Ref. 3, p 2].

Lift axles are allowed to operate in South Dakota on non-IS highways and with permit only. An annual permit can be obtained, which allows a motor vehicle to be overweight when making a turn due to the lifting of a lift axle or a variable load axle in order to make the turn. The permit allows lifting only one axle, and the axle must be lowered within 100 feet after completing the turn. [Ref. 3, p 20].

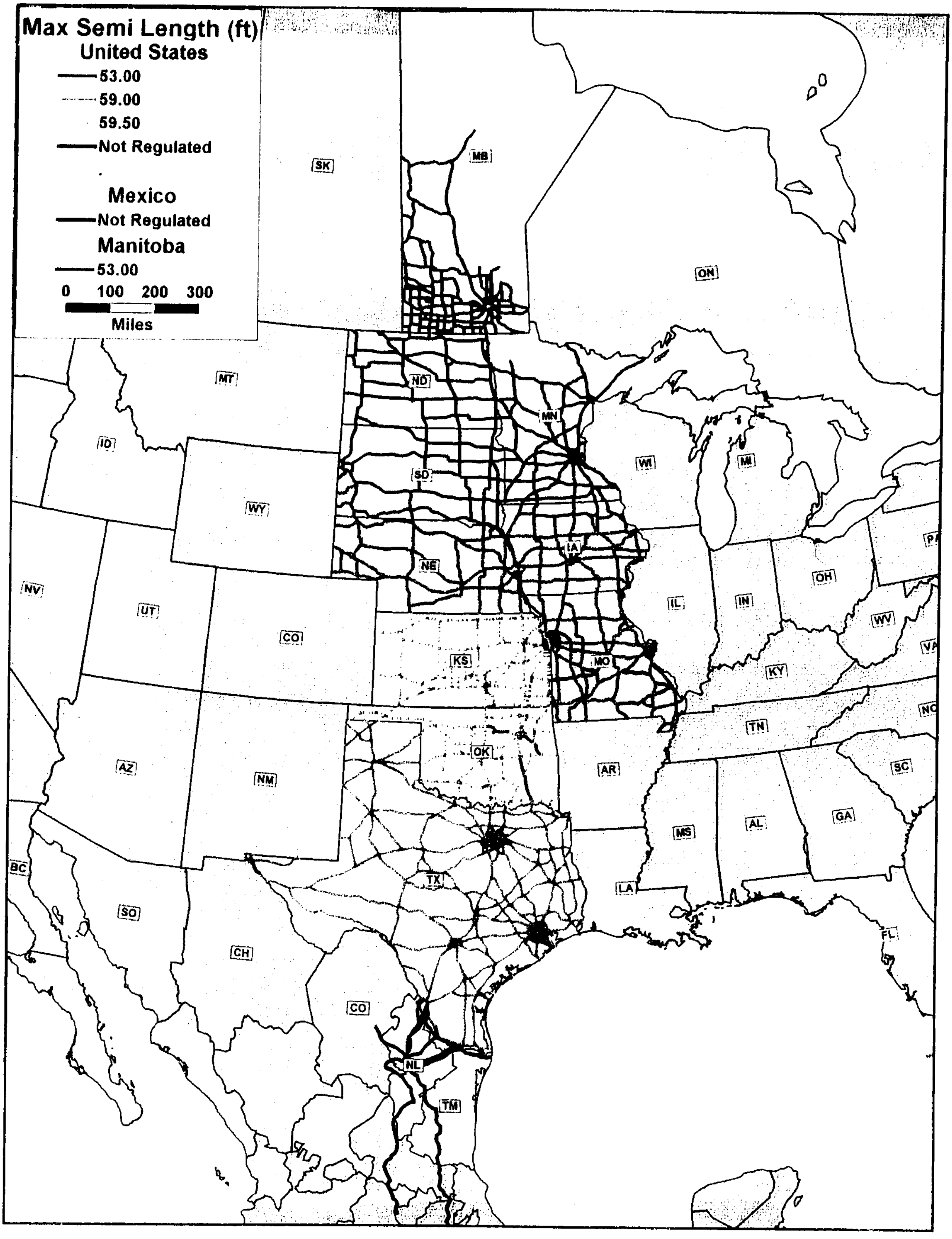
Nebraska

The limits specified by the ISTEA freeze for a truck tractor and 2 trailing units are: [Ref. 4, p 328]

- Maximum GVW of 95,000 pounds.
- Cargo-carrying length of 95 feet. If the combination has a cargo-carrying length of less than 65 feet, it may operate on all State highways. However, if the cargo-carrying length is over 65 feet, the combination is required to operate empty. For these combinations, access to and from IS highways is limited to designated staging areas within six miles of I-80 between the Wyoming-Nebraska border and Exit 440 (Nebraska Route 50).
- When the cargo-carrying unit is over 65 feet in length but under 85 feet, the semitrailer cannot exceed 48 feet in length and the full trailer cannot be less than 26 feet or more than 28 feet long. The shorter trailer must be placed to the rear.

Figure 2-3

Maximum Specified Semitrailer Length on NHS Highways in the Corridor States, on the PTH System in Manitoba and on Federal Highways in Mexico



Source: State and Provincial Regulations, FHWA Working Paper No. 14, Code of Federal Regulations, and Mexican Regulations

- When the cargo-carrying units have a length greater than 85 feet, up to and including 95 feet, the trailers must be of approximately equal length.

The limits specified by the ISTEA freeze for a truck tractor and 3 trailing units are: [Ref. 4, p 329]

- Cargo-carrying length of 95 feet. These combinations must have trailers of approximately equal length and the overall vehicle length cannot exceed 105 feet.

- If the cargo-carrying unit is over 65 feet in length, the units are required to travel empty.

- Triples can only operate on I-80 from the Wyoming-Nebraska border to Exit 440 (Nebraska Route 50). [Ref. 4, p 329].

Nebraska applies Bridge Formula B to operations on both IS and non-IS highways and requires compliance with the formula from both the inner and outer bridge perspectives. The maximum specified GVW is 80,000 pounds for operations on IS highways, but by obtaining a readily available "Conditional Safety Weight Permit", trucks can operate at GVWs of up to 95,000 pounds on the IS as long as they comply with the Bridge Formula requirements. [Ref. 12, p 6]. For operations on State highways, the maximum allowed GVW is 95,000 pounds.

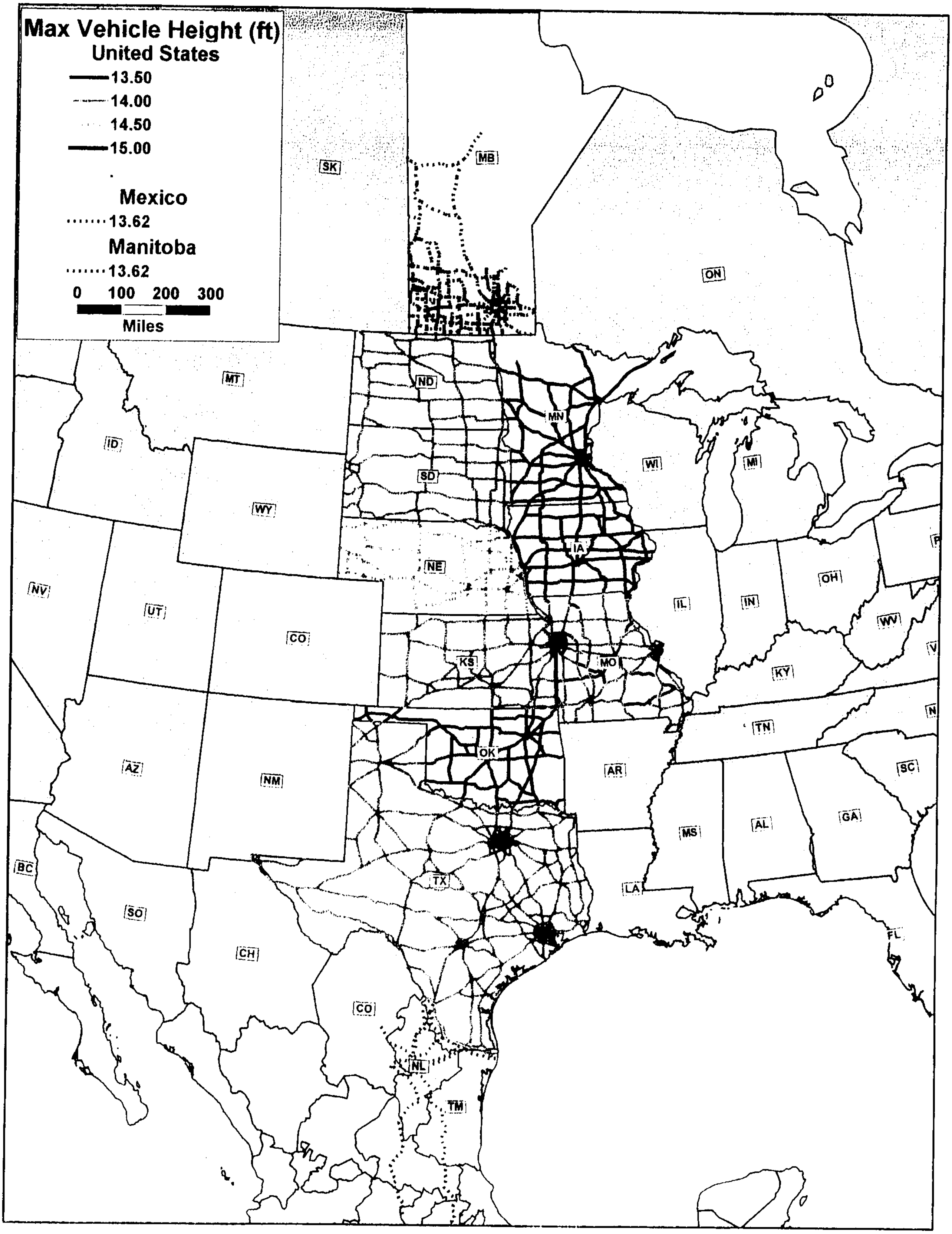
Nebraska does not regulate kingpin settings or the overall length of a tractor-semitrailer. The maximum allowable length of a semitrailer is 53 feet on NN and non-NN highways. Nebraska is the only corridor State limiting the height of a vehicle to 14.5 feet on NN and non-NN highways. Figure 2-4 illustrates maximum specified vehicle heights for States in the corridor.

Minnesota

There are no ISTEA freeze provisions applicable for Minnesota.

Figure 2-4

Maximum Specified Vehicle Height in the Corridor States, in Manitoba and in Mexico



Source: Individual State and Provincial Regulations and Rand McNally Motor Carrier's Road Atlas

Minnesota's truck route network is comprised of two types of roads: (1) 10-Ton Routes or Designated Highways, defined as "highways that are capable of carrying increased axle weights and gross vehicle weights without undue damage or wear to the highway"; and (2) 9-Ton Routes, defined as "all other streets and highways which are subject to lesser weight limitations" [Ref. 6]. These are most city, county and township roads. This research deals with regulations on only the 10- Ton Routes, since they comprise all IS and NN highways in Minnesota.

Minnesota applies a bridge formula on both IS and non-IS highways which has minor differences with Bridge Formula B (500 pounds GVW at some axle spreads). This formula is capped at 80,000 pounds.

During the period of December 1 through December 31 each year, Minnesota allows a 10 percent weight increase on 10-Ton Routes in the northern portion of the State. The same increase is in effect statewide during the period of January 1 through March 7 each winter. This 10 percent increase applies to axle weight and GVW limits, and Bridge Formula limitations. No permit is required to operate with the increased winter weights on 10-ton routes which are not part of the Interstate System. However, a permit is required for a motor vehicle, trailer, or semi-trailer combination to operate at more than 80,000 pounds GVW on IS highways. This permit is obtained "across-the-counter".

On the foremost and rearmost steering axle, tire weights are limited to the lesser of 600 pounds per inch of tire width or the manufacturer's recommended load. On other axles, no tire can be loaded heavier than 500 pounds per inch of tire width or manufacturer's recommended maximum load, whichever is less. Tire load limits increase during the winter months due to the 10 percent weight increase allowance.

Minnesota applies the Bridge Formula to tridem-axle groups with a special provision that no single axle of a tridem can exceed 15,000 pounds. A typical tridem axle with a 9-foot spread is allowed a weight of 43,000 pounds on both IS and non-IS highways.

Minnesota limits the length of a semitrailer to 53 feet on all highways and requires compliance with a kingpin setting of 41 feet to the center of the rear tandem (41-0 KCRT).

Iowa

There are no ISTEA freeze provisions applicable for Iowa.

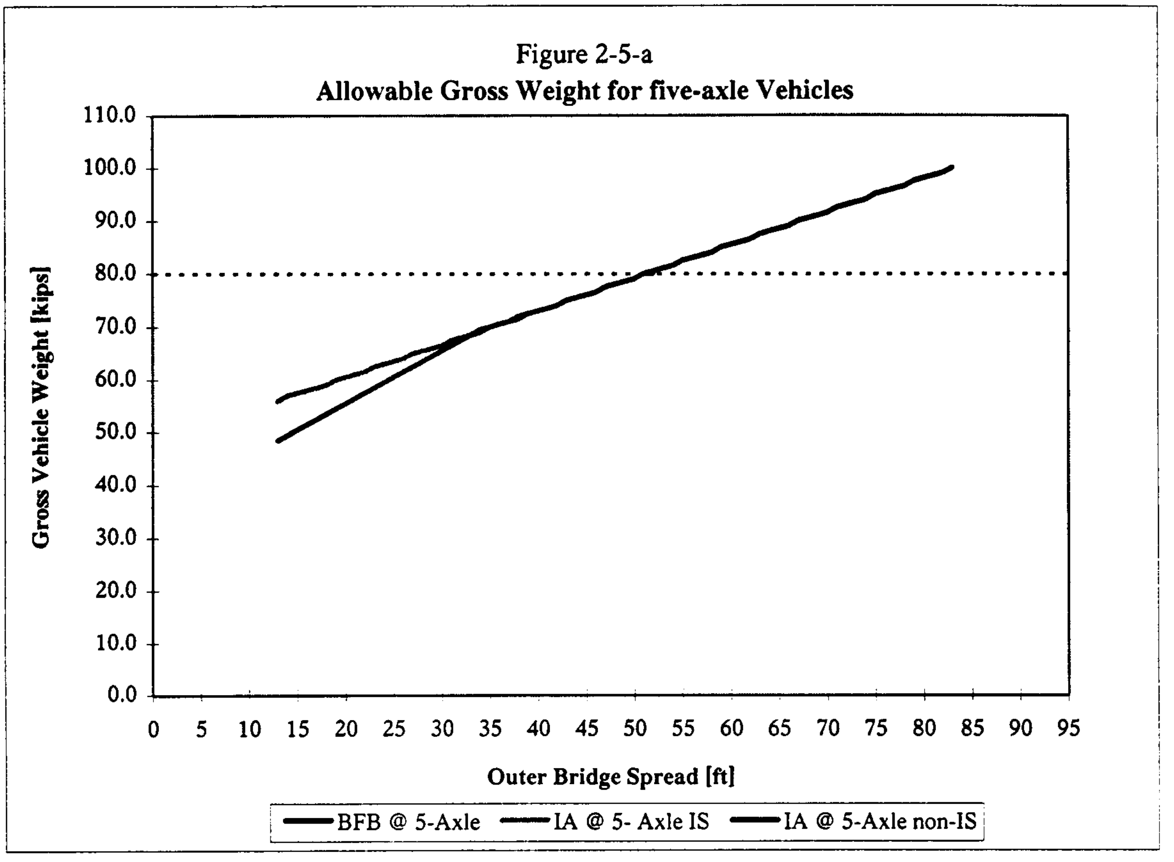
The GVW on IS highways in Iowa is controlled by Bridge Formula B, and is capped at 80,000 pounds.

On non-IS highways, the GVW is controlled by a unique Bridge Formula. This Formula is also capped at 80,000 pounds. It differs from Bridge Formula B as follows:

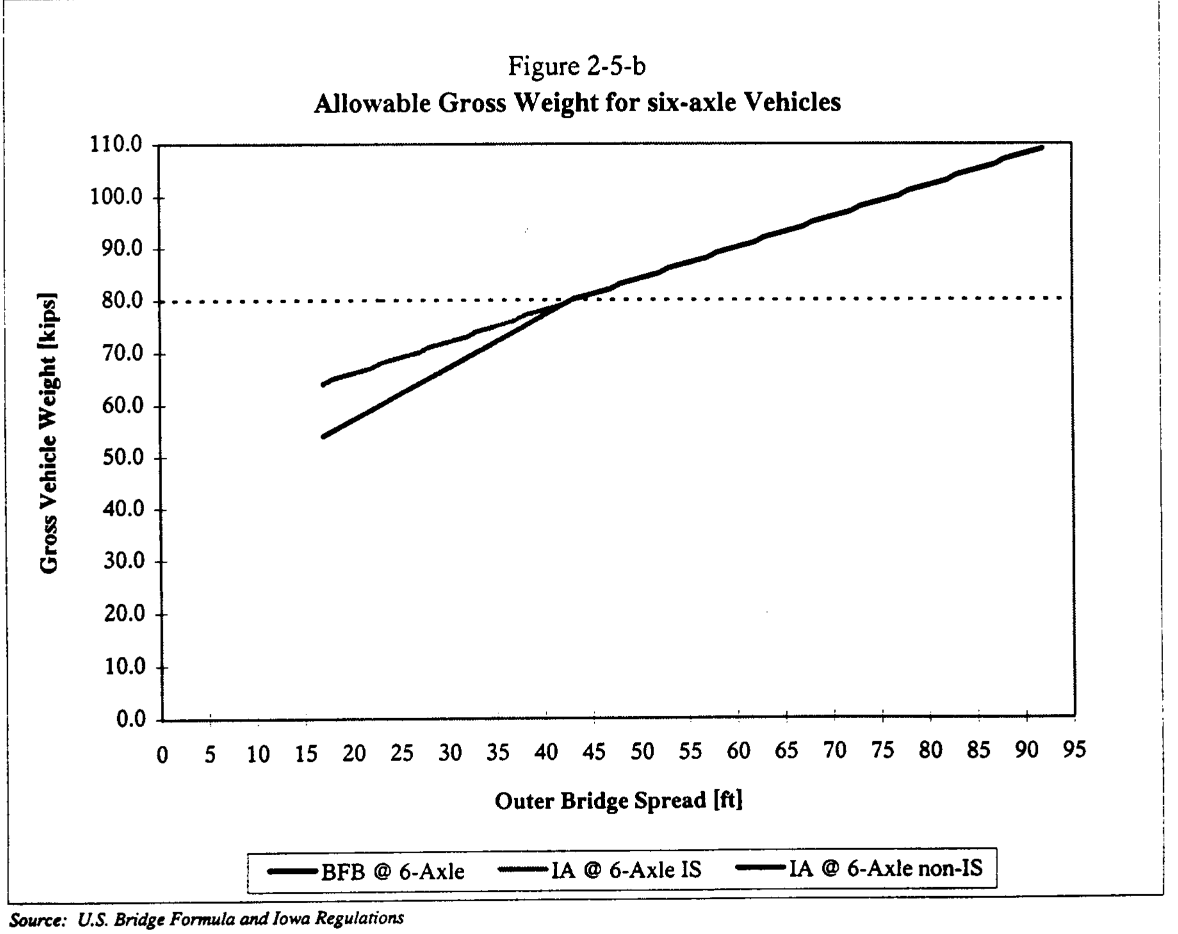
- For 2 and 3-axle trucks, there is no difference.
- For an outer bridge of up to and including 18 feet, the allowable GVWs specified by the Iowa Formula for 4-axle units range from 47,000 pounds at 12 feet, to 53,000 pounds at 18 feet (versus 50,000 pounds to 54,000 pounds in Bridge Formula B for 4-axle units). Gross vehicle weights specified for all other axle spreads for 4-axle units are the same for both formulas.

Figures 2-5-a and 2-5-b illustrate the differences between Bridge Formula B and the Iowa Formula applied on non-IS highways for five and six-axle vehicles.

Iowa limits the length of a semitrailer to 53 feet on all highways (Figure 2-3). Iowa enforcement officials advise that previous kingpin setting requirements have been removed with the elimination of the States's non-designated highway network.



Source: U.S. Bridge Formula and Iowa Regulations



Source: U.S. Bridge Formula and Iowa Regulations

Missouri

The length limit specified by the ISTEA freeze for a truck-tractor and 2 trailing units is 109 feet and the GVW limits are:

- 120,000 pounds when entering Missouri from Kansas
- 95,000 pounds when entering Missouri from Nebraska
- 90,000 pounds when entering Missouri from Oklahoma

For a truck-tractor and 3 trailing units (triple), the ISTEA freeze specifies a length limit of 109 feet and the following GVW limits:

- 120,000 pounds when entering Missouri from Kansas
- 90,000 pounds when entering Missouri from Oklahoma

ISTEA provisions state that Missouri allows vehicles (both with 2 and 3 trailing units) from neighbouring States access to terminals in Missouri which are within 20 miles of the Missouri State Line. [Ref. 4, p 325].

Based on telephone conversations with Missouri State Highway Patrol officials (June 19 and June 24, 1996), it was learned that truck-tractors with 2 or 3 trailing units are not allowed to operate or enter Missouri at GVWs greater than 80,000 pounds, except in commercial zones. A special permit is issued by Missouri when there is a need to operate these units at GVWs greater than 80,000 pounds but only if the unit is hauling an indivisible load. If no indivisible load is being hauled, no truck is allowed to operate or enter Missouri at weights greater than 80,000 pounds, except at commercial zones (Figure 2-2). In practice, most trucks enter Missouri at commercial zones.

The GVW in Missouri is controlled by Bridge Formula B, except in commercial zones. The Bridge Formula is capped at 80,000 pounds GVW. Missouri uses the Formula on both internal and external axle measurements on IS and designated highways and 10 miles from such highways. On all other highways, the same formula is used with a 2,000-pound tolerance and a maximum GVW of 80,000 pounds. For example, the axle weights on a 5-axle tractor-semitrailer are increased from 34,000 pounds to 36,000 pounds on the tandem group, and from 20,000 pounds to 22,000 pounds on the steering axle. However, this weight tolerance only increases flexibility of loading, since the maximum allowed GVW cannot exceed 80,000 pounds. Missouri is the only corridor State that restricts the width of a truck to 8.0 feet on non-NN highways. [Ref. 7, p 12].

There are four commercial zones in Missouri: (1) St. Louis, (2) Kansas City, (3) Springfield, and (4) St. Joseph. In the commercial zones, the GVW is not specifically restricted but the maximum axle weight cannot exceed 22,400 pounds. Thus, for example, a 5-axle truck operating in a commercial zone is allowed to haul a GVW of as much as 112,000 pounds. Likewise, a 7-axle truck operating under the same conditions is allowed to haul as much as 156,800 pounds. [Ref. 15].

The maximum height of any vehicle or combination of vehicles in the commercial zone in St. Louis, Kansas City, Springfield and St. Joseph is 15 feet. The maximum allowable height on IS, NN and other State designated highways plus 10 miles from those highways is 14 feet. On all other highways, the maximum allowable height is 13.5 feet. Figure 2-4 illustrates the maximum specified vehicle height on NHS highways for the corridor States.

Missouri limits the length of a semitrailer to 53 feet on IS, NN and other State designated highways. This semitrailer length also applies to vehicles operating in commercial zones. The length of a semitrailer is not regulated on non-NN highways but the overall length of the combination is subject to a maximum of 60 feet (there is a significant mileage of non-NN highways, almost the same mileage quantity as IS highways). For a tractor-double trailer combination operating on IS, NN and other State designated highways, the overall length is not regulated. However, each of the trailers is limited to 28 feet.

Kansas

The limits specified by the ISTEA freeze for a truck-tractor and 2 trailing units are: [Ref. 4, p 321]

- Maximum GVW of 120,000 pounds.
- Cargo-carrying length of 109 feet, applicable on the Kansas Turnpike and a limited number of designated NN highways.

The limits specified by the ISTEA freeze for a truck-tractor and 3 trailing units (a triple) vary according to two sets of criteria: (1) the Turnpike and the Turnpike access rules and (2) the Special Vehicle Combination (SVC) rules, which apply off of the Turnpike except in the case of vehicles operating under Turnpike access authority. [Ref. 4, p 321].

For the Turnpike and Turnpike access rules:

- Maximum GVW is 120,000 pounds.
- Maximum combination vehicle length is 119 feet overall.

For the SVC rules:

- The maximum allowable GVW is 110,000 pounds on I-70 between the Colorado-Kansas border and Exit 19 at Goodland.
- Maximum cargo-carrying length is approximately 95 feet. Trailers must be of no more than 28.5 feet maximum length

In all cases, ISTEA vehicles must comply with Bridge Formula B.

Kansas applies a special Bridge Formula to operations on both IS and non-IS highways and requires compliance with the formula from both the inner and outer bridge perspectives. The GVW on IS highways in Kansas is capped at 80,000 pounds, except on the Kansas Turnpike and on I-70 between the Colorado-Kansas border and Exit 19 at Goodland. On non-IS highways the maximum allowed GVW is 85,500 pounds. This Bridge Formula has minor differences with Bridge Formula B. There is no difference between the two formulas for 2-, 3-, 4-, 7- and 8-axle trucks. Minor differences (500 pounds GVW) exist for 5-axle trucks at 38 feet and 6-axle trucks at 53 feet. The Kansas Formula does not specify allowable weight for trucks with more than 8 axles because they are rare in Kansas.

Kansas does not regulate kingpin settings or the overall length of a tractor-semitrailer. The maximum allowable length of a semitrailer is 59.5 feet on NN and non-NN highways. Kansas does not regulate the overall length of a tractor-double trailer combination, but does restrict the length of each trailer within a double to 28.5 feet.

Trucking companies that desire to become certified to operate truck tractors with 2 and 3 trailing units (SVCs) in Kansas must submit a written request asking to become certified to the Kansas Department of Transportation. The Kansas DOT issues these "Special Vehicle Combination Program" permits at a cost of $ 2,000.00 per company and $ 50.00 per power unit. The permit is good for one year, after which, the application process must be repeated. Table 2-3 shows the number of permits (*i.e.* number of power units) that were issued by the Kansas DOT from 1993 to 1995 for the operation of special vehicle combinations.

Kansas Turnpike Authority (KTA) permits are issued to companies that need to leave the Kansas Turnpike to go to terminals that are located not more than 10 miles from the Turnpike (these are semiannual permits). No permit is required to operate on the Turnpike itself. Special Vehicle Combination permits are issued to companies that operate units on the I-70 entering from Colorado into Kansas (these are annual permits). These units are allowed to operate only from the Colorado-Kansas border to exit 19 at Goodland on I-70. At this location, the combination must be taken apart.

Table 2-3
Permits Issued by the Kansas Department of Transportation for the Operation of Special Vehicle Combinations

Year	KTA	SVC
1993	802	619
1994	1,192	836
1995	762	784

Source: Kansas Department of Transportation
KTA Kansas Turnpike Authority
SVC Special Vehicle Combination
Each power unit requires one permit

Oklahoma

The limits specified by the ISTEA freeze for a truck-tractor and 2 trailing units are 110 feet cargo-carrying length with no trailer exceeding 53 feet and 90,000 pounds GVW. For a truck-tractor and 3 trailing units, the freeze limits the cargo-carrying length to 95 feet with no trailer exceeding 29 feet and the GVW to 90,000 pounds. An annual special combination permit is required for the operation of double- and triple-trailer combinations on the IS and other four-lane divided primary highways. These combinations must also comply with Bridge Formula B.

For vehicles that do not qualify as Longer Combination Vehicle (LCVs), Oklahoma applies a bridge formula very similar to Bridge Formula B to operations on IS and non-IS highways and requires compliance with the formula from both the inner and outer bridge perspectives. The GVW on IS highways in Oklahoma is capped at 90,000 pounds and on non-IS highways it is also capped at 90,000 pounds. The Oklahoma Formula differs from Bridge Formula B as follows: [Ref. 14].

- For 2-axle trucks, there is no difference.

- Vehicles exceeding 6 axles are capped at 90,000 pounds for IS operations and 90,000 pounds at 60 feet of external bridge for non-IS operations.

- For an outer bridge of up to and including 25 feet, the allowable GVWs specified by the Oklahoma Formula for 3-axle trucks are the same as those specified for 3-axle trucks by Bridge Formula B. For outer bridges greater than 25 feet, the Oklahoma Formula allows GVWs greater (from 500 to 4,000 pounds) than those allowed by Bridge Formula B for 3-axle trucks.

- For outer bridges of up to and including 30 feet, and for outer bridges greater than 47 feet, the allowable GVWs specified by the Oklahoma Formula for 4-axle trucks are the same as those specified for 4-axle trucks by Bridge Formula B. For outer bridges between 31 feet and 46 feet, the Oklahoma Formula has minor differences (500 pounds GVW) with Bridge Formula B.

- Minor differences (500 pounds GVW) exist for 5-axle trucks at 31 and 38 feet and 6-axle trucks at 32 feet.

Double-trailer combinations with 29-foot trailers may use any route on the National Network. If the length of at least one trailer or semitrailer in the vehicle is over 29 feet, the vehicle is only allowed to operate on: [Ref. 4, p 339]

- I-35 from the Texas-Oklahoma border to the Kansas-Oklahoma border
- I-40 from the Texas-Oklahoma border to the Arkansas-Oklahoma border
- I-44 from the Texas-Oklahoma border to the Missouri-Oklahoma border
- I-235 entire length in Oklahoma City
- I-240 entire length in Oklahoma City
- I-244 entire length in Tulsa
- I-444 entire length in Tulsa
- A series of other multi-lane divided highways on the National Network

Triple-trailer combinations are also restricted to operate on the same highways.

Oklahoma is the only WASHTO State limiting vehicle height to 13.5 feet (Figure 2-4). It is also one of the few States that allows 59.5-foot semitrailers on all highways of the National Network.

The Oklahoma Department of Public Safety issues longer combination vehicle (LCV) and special combination vehicle (SVC) permits to companies that wish to operate these types of vehicles. LCV permits are issued annually to the tractor for a $20.00 annual fee. SVC permits are issued to the tractor for a $10.00 per month fee. Table 2-4 shows the number of LCV and SVC permits issued between 1992 and 1995 in Oklahoma.

Table 2-4
Permits Issued by the Oklahoma Department of Transportation for the Operation of LCVs and SVCs

Year	**LCV**	**SVC**
1992	--	207
1993	--	226
1994	187	275
1995	120	237

Source: Oklahoma Department of Public Safety

Texas [Ref. 8, p 17]

There are no ISTEA freeze provisions applicable for Texas.

Texas applies Bridge Formula B on both IS and non-IS highways. The Formula is capped at 80,000 pounds GVW on IS highways. Texas provides an "Annual Overweight Tolerance Permit" (called permit 2060) permitting operation at a 5 percent tolerance on GVW and a 10 percent tolerance on axle weights on non-IS highways (*i.e.* State roads and selected county roads). The permit allows a truck to operate at up to 84,000 pounds GVW, and at single and tandem axle loads of 22,000 pounds and 37,400 pounds respectively. This permit is readily available for any vehicle which is otherwise registered for 80,000 pounds GVW and is capable of operating at the higher GVW authorized by the permit. This tolerance permit overrides the provisions of Bridge Formula B creating a modified version of Bridge Formula

B for operations on non-IS highways. Principal users of these permits are gravel haulers, grain haulers, oilfield haulers and cattle haulers.

In a number of interviews conducted along the U.S.-Mexico border, Mexican truck drivers operating into Texas explained the Texas GVW law in terms of the payloads that they are allowed to handle, rather than the allowed gross load. They said that they are allowed to haul 22 metric tonnes (payload) on a 3-S2, or 22 metric tonnes plus 4,000 pounds on a 3-S3. The 22 metric tonnes (48,400 pounds) would generally comply with an 80,000 pound GVW limit, and the 22 tonnes plus 4,000 pounds would generally comply with an 84,000 pound GVW limit. On Texas highways, the semitrailer length limit is 59 feet and the maximum vehicle height is 14 feet.

2.2.3 Regulation Details for Manitoba Provincial Highways [Ref. 9, p 2-7]

Truck size and weight regulations for Manitoba provincial highways are specified under the authority of the Highway Traffic Act. Manitoba's TS&W limits are specified in terms of five variables:

VARIABLE 1 basis of regulation	VARIABLE 2 vehicle class	VARIABLE 3 highway class	VARIABLE 4 season	VARIABLE 5 date of manufacture
RTAC	straight truck	RTAC	not-winter	
non-RTAC	truck & pony trailer	A1	winter	
	tractor-semitrailer	B1		
	tractor-semi-trailer (A-train)	A		
	tractor-semi-semi (B-train)	B		
	tractor-semi-trailer (C-train)	C		

Road classes A, B and C are not provincial highways. Class A is City of Winnipeg streets. Classes B and C are municipal roads. Table 2-5 presents selected aspects of the de facto TS&W provisions governing regular operations on major highways in Manitoba. These are compared with the Canadian standard limits specified in the Canadian RTAC Memorandum of Understanding (MoU).

Table 2-5
TS&W Regulations Governing Regular Operations in Manitoba Provincial Highways
(dimensions in meters and weight in kilograms)

	MOU	Manitoba RTAC	Manitoba A1	Manitoba B1
Width	2.6	*		*
Height	4.15	*		*
Maximum Length				
Straight Truck	12.5	*	*	*
Full trailer	12.5	*	*	*
Semitrailer				
RTAC	16.2	*	*	*
non-RTAC	NA	NR	NR	NR
Truck + pony trailer				
RTAC	NR	23	23	23
non-RTAC	NA	21.5	21.5	21.5
Truck + full trailer				
RTAC	23	*	*	*
non-RTAC	NA	23	23	23
Tractor-semitrailer				
RTAC	23	*	*	*
non-RTAC	NA	20	20	20
A-train double				
RTAC	25	*	*	*
non-RTAC	NA	23	23	23
B-train double				
RTAC	25	*	*	*
non-RTAC	NA	23	23	23
C-train double				
RTAC	25	*	*	*
non-RTAC	NA	23	23	23
Box Length (front to end of cargo-carrying units)				
Truck + pony trailer				
RTAC	18.5	*	*	*
non-RTAC	NA	NR	NR	NR
Truck + full trailer				
RTAC	18.5	*	*	*
non-RTAC	NA	NR	NR	NR
A-train double				
RTAC	18.5	*	*	*
non-RTAC	NA	NR	NR	NR
B-train double				
RTAC	20	*	*	*
non-RTAC	NA	NR	NR	NR
C-train double				
RTAC	20	*	*	*
non-RTAC	NA	NR	NR	NR
Tire Weight (kg/mm)				
Steering (kg/mm)	10			
Other (kg/mm)	10			
Tire Limit (kg/tire)	3000			

	MOU	Manitoba RTAC	Manitoba A1	Manitoba B1
Axle Weight				
Steering				
straight truck	NR	7300	7300	7300
tractor	5500	*	*	*
Single (dual tires)	9100	*	*	8200
Tandem (1.00 - 1.85)				
RTAC	17000	*	16000	14500
non-RTAC	NA	16000	16000	14500
Tridem				
RTAC (2.44)	21000	*	*	20000
RTAC (3.05)	23000	*	*	20000
RTAC (3.66)	24000	*	23000	20000
Gross Weight (subject to proper axle spacings and adequate tire and axle capacity)				
Straight Truck				
RTAC	22500	24300	23300	21800
non-RTAC	NA	23300	23300	21800
Truck + pony trailer				
RTAC	43500	45300	44300	41800
non-RTAC	NA	39300	39300	36300
Truck + full trailer				
RTAC [7]	53500	55300	54300	47630
non-RTAC	NA	55300	54300	47630
Tractor-semitrailer				
RTAC	46500	*	44500	40000
non-RTAC	NA	37500	37500	34500
New A-train double				
RTAC	53500	*	*	47630
non-RTAC	NA	53500	53500	47630
B-train double				
RTAC	62500	*	56500	47630
non-RTAC	NA	53500	53500	47630
C-train double				
RTAC	58500	60500	53500	47630
non-RTAC	NA	53500	53500	47630
Bridge Formula	No explicit formula. Specified in terms of minimum interaxle spacings and wheelbase			
Interaxle Spacings				
RTAC	single to single 3.00			
	single to tandem 3.00			
	single to tridem 3.00			
	tandem to tandem 5.00			
	tandem to tridem 5.50			
non-RTAC	varies depending on vehicles if different than RTAC, less restrictive than RTAC			

<u>Notes:</u>
* means same as MOU
NA not applicable
NR not regulated
MOU Canadian RTAC Memorandum of Understanding

Sources: (1) The Highway Traffic Act: Vehicle Weights and Dimensions on Classes of Highways Regulation and (2) Weights and Dimensions Compliance Guide--Manitoba Highways and Transportation. October 1995

There is no explicit bridge formula in Manitoba's regulations. Bridge loading considerations are instead dealt with by specifying minimum interaxle spacings--meaning the minimum longitudinal distance separating two axle units as determined from the centres of each of the axles that is the closest to the other axle unit.

On Provincial highways, Manitoba provides a winter weight allowance of 10 percent. This allowance:

- does not apply to front steering axles.
- does apply to other single and tandem axles having dual tires.
- does not apply to tridem axles.
- does not apply to the 62,500 kg maximum GVW limit on RTAC highways.
- does not apply to the 56,500 kg maximum GVW limit on A1 highways.
- does not apply to the 47,630 kg maximum GVW limit on B1 highways.
- does not apply to the 10 kg/mm and 3,000 kg/tire limits.

For example, a 5-axle tractor-semitrailer operating on an RTAC route in the winter, can do so at a GVW of 42,900 kilograms (94,380- pound). This is achieved by having 18,700 kilograms on the tandem axles plus 5,500 kilograms on the steering axle. At this GVW, this truck cannot operate into North Dakota because: (1) it exceeds the maximum GVW of 80,000 pounds applicable to this vehicle on the IS in North Dakota; and (2) it exceeds the maximum GVW of 88,000 pounds on non-IS higways resulting from the 10 percent winter weight allowance in North Dakota.

Another example is an 8-axle B-train operating on an RTAC highway. This vehicle is nomally restricted to a maximum GVW of 62,500 kilograms. With the 10 percent winter weight allowance, the tandem axle weights can increase from 17,000 to 18,700 kilograms. However, the GVW cannot increase from 62,500 to 65,900 kilograms due to the 62,500-kilogram cap.

2.2.4 Mexican TS&W Regulations [Ref. 8, p 18]

Mexico prescribed new regulations for Federal highways and bridges in 1994 (NOM-EM-012-SCT-2-1994). The Mexican Federal law also applies to all Mexican State highways.

The GVW component of these new regulations was phased-in over a two year period in Mexico. Most of the limits discussed in this research were implemented on November 1, 1996.

Mexican regulations vary by: (1) road class; (2) axle configuration; (3) number of tires on an axle; (4) vehicle type; (5) number of tires on a vehicle; and (6) the presence or absence of air suspension. Mexico is one of the few countries which provides a weight bonus (5 percent) to truckers who utilize air suspension systems.

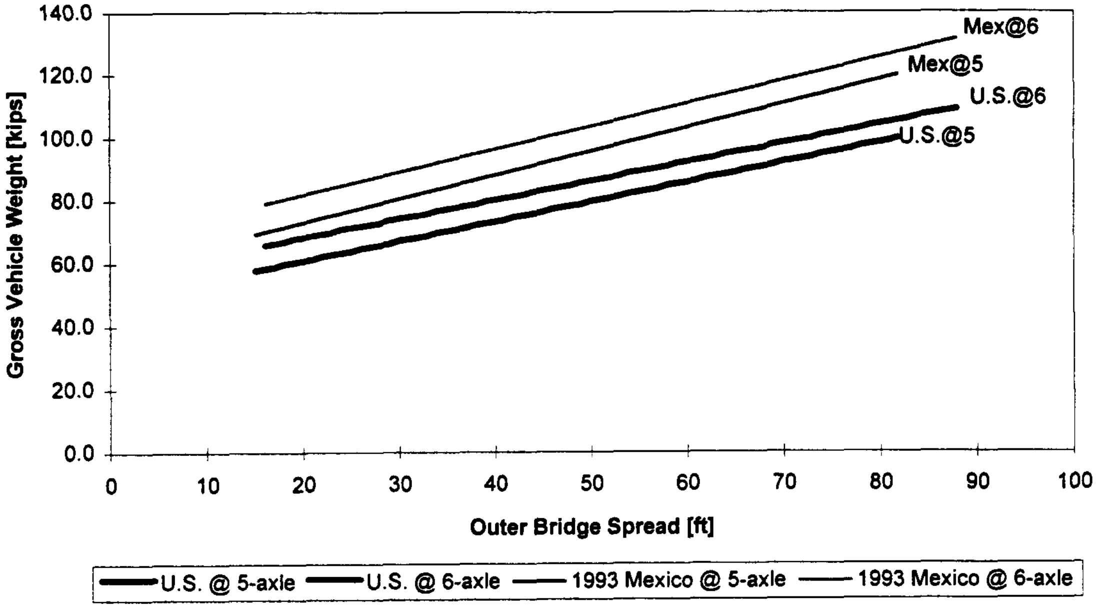
The GVW limits established for the various truck types are the lesser of: (1) the outer bridge limit determined from the Mexican Bridge Formula (using typical dimensions respecting kingpin setting, axle positions, and rear overhang for the given vehicle configuration); (2) the sum of the allowable axle weights on the given configuration; or (3) the manufacturer's GVW rating. Figure 2-6 shows the Mexican Bridge Formula in comparison to Bridge Formula B.

Weight

Mexico's axle weight limits are 11.0 tonnes (24,255 pounds) on single drive axles, 10.0 tonnes (22,050 pounds) on single non-drive axles, 19.5 tonnes (42,997 pounds) on drive tandem axles, 18.0 tonnes (39,690 pounds) on non-drive tandem axles, and 22.5 tonnes (49,613 pounds) on non-drive tridem axles. GVW limits on Class A2 and A4 Mexican highways for the truck types typically used in crossborder trucking are: [Ref. 17].

Figure 2-6

U.S. and Mexico Bridge Formulas



<u>1994 Mexican Regulations</u> (effective November 1, 1996)

PBV = 899.4 [DE x N / (N-1) + 3.66xN + 11]

Where:

PBV = Gross Vehicle Weight [kg]
DE = Distance between extreme axles [m]
N = Number of axles

Sources: Taken from Reference 8

- U.S. Bridge Formula B
- Mendoza, Alberto and Juan Reyes. *"Estudios de Pesos y Dimensiones de los Vehiculos que Circulan Sobre las Carreteras Nacionales".* Instituto Mexicano del Transporte. Secretaria de Comunicaciones y Transportes, Publicacion Tecnica No. 51, Queretaro, 1994

- 2-axle truck (6 tires) 17.5 tonnes (38,587 pounds)
- 3-axle truck (10 tires) 26.0 tonnes (57,330 pounds)
- 3+2 truck trailer (18 tires) 46.0 tonnes (101,430 pounds)
- 2-S2 tractor-semitrailer (14 tires) 35.5 tonnes (78,277 pounds)
- 3-S2 tractor-semitrailer (18 tires) 44.0 tonnes (97,020 pounds)
- 3-S3 tractor-semitrailer (22 tires) 48.5 tonnes (106,942 pounds)
- 2-S1-2 tractor-double (22 tires) 56.0 tonnes (123,480 pounds)

These GVW limits are increased by 5 percent when the vehicle is equipped with air suspension on all its axles, except the steering axle. The allowable weight on a steering axle is 6.5 tonnes (14,300 pounds).

Mexican regulations prescribe axle weight limits as a function of axle configuration and number of tires, thereby establishing an effective limit on tire loads. These regulations can prohibit the effective use of super single tires in Mexico which may be permitted in the U.S. Mexico prescribes a tire pressure limit of 6 kgf/cm^2 (0.586 MPa or 85 psi) when cold.

Dimensions

Mexico limits the vehicle width to 2.60 meters (102 inches) and the height is restricted to 4.15 meters (13.62 feet).

Mexican regulations do not limit the length of a semitrailer. However, the overall length of a tractor semitrailer is limited to 20.8 meters (68.24 feet). This length permits the use of 53-foot semitrailers with both cab over engine (COE) and cab behind engine (CBE or conventional) tractors having a wheelbase of about 200 inches. This length does not allow the use of very long wheelbase tractors (say 244 inches). Mexican regulations do not specify limitations on kingpin (*perno rey*) settings.

2.3 Travel Time Comparisons

Figure 2-7 illustrates highway travel time contours from Kansas City, Missouri to cities located in the corridor States. The times shown in this figure represent travel times on I-35 or I-29. The figure indicates the following:

- Kansas City is located almost at the heart of the Mid-continent corridor. Travel time to Winnipeg, Manitoba is about 12 hours and to Laredo, Texas is about 16 hours.
- Trucks leaving Winnipeg can be in the U.S.-Mexico border (at Laredo) in approximately the same time that they can be in Vancouver or in Montreal. [Ref. 9, p 2-37].
- Kansas City is within 8 hours of most major population centers in the U.S.
- Trucks leaving Kansas City can be in Monterrey in approximately the same time that trucks leaving Winnipeg can be in Toronto.

2.4 Summary

This chapter presents selected characteristics about the transportation system, and most particularly, about the truck size and weight regulations in the corridor, of potential relevance to the consideration of TS&W policy options.

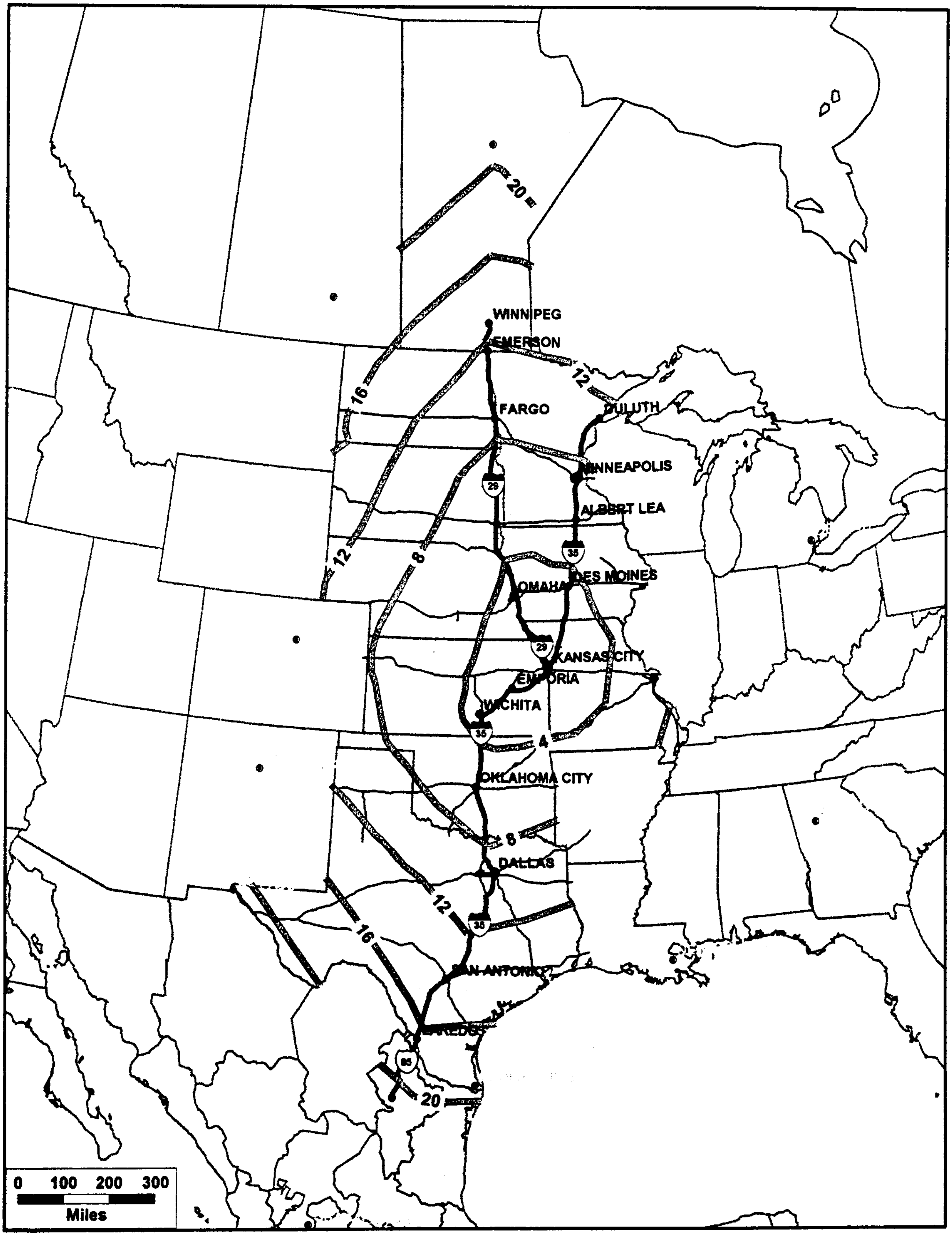
2.4.1 Highways in the Corridor States

There are 9,607 miles of IS highways in the corridor States (21 percent of the national IS network). Also in the corridor States there are: (1) 29,503 miles of NHS highways which are not IS highways; (2) 6,894 miles of NHS highways which are not IS or NN highways; and (3) 31,493 miles of NN highways which are not NHS or IS highways.

Much of the Mid-continent corridor is highly rural in character, while certain sections

Figure 2-7

Travel Time from Kansas City to Other Cities in the Corridor [hours]



Source: Rand McNally Motor Carrier's Road Atlas involve intense urbanization. Most sections are non-toll, while some are tolled. Many sections involve low to medium truck volumes, while some involve very high volumes.

Much of the interstate transportation activity in this corridor runs east-west to and from or through the corridor States. Principal east-west highways are: the I-94 (Montana-Minneapolis-Chicago); the I-90 (Seattle-Sioux Falls-Chicago); the I-80 (San-Francisco-Omaha-Chicago); the I-70/I-15 (Los Angeles-Kansas City-St. Louis); the I-40 (Los Angeles-Oklahoma City-Little Rock); the I-30 (Dallas-Little Rock); the I-20 (El Paso-Birminghan); and the I-10 (Los Angeles-San Antonio-New Orleans).

2.4.2 TS&W Regulations Governing Trucking in the Corridor States

The TS&W laws and regulations which directly govern trucking in the corridor are promulgated and administered by the nine corridor States, the Federal Government, and certain metropolitan areas. In addition, however, TS&W regulations from throughout the country, Mexico and Canada, also influence trucking in the corridor States because of: (1) the extensive transportation linkages of corridor States with adjacent States and the rest of the country; (2) the movements of commodities between the west and east through the corridor States; (3) the importance of Texas in terms of Mexico border crossings; and (4) the linkages of Minnesota to western Canada.

Weight Limits

- Axle weight limits in the corridor States vary from the standard 20,000 and 34,000 pounds on single and tandem axles respectively as follows: (1) in North Dakota, on all highways, axle weight limits on steering axles are 12,100 pounds; (2) in North Dakota, on non-IS highways in winter months, axle weight limits are 13,310 on steering axles, 22,000, 37,400 and (up to) 52,800 pounds on single, tandem and tridem axles respectively (a 10 percent winter axle weight allowance, subject to a 10 percent winter GVW allowance); (3) in Missouri, on non-IS highways, axle weight limits are 22,000 and 36,000 pounds on single and tandem axles respectively; (4) In

Missouri, in commercial zones, individual axles are limited to a weight of 22,400 pounds (with a tandem axle being therefore limited to 2 * 22,400 = 44,800 pounds); (5) In Minnesota, on all highways from January 1 to March 7 (winter months), axle weight limits are 22,000, 37,400 and (up to) 47,850 pounds on single, tandem and tridem axles respectively (a 10 percent winter axle weight allowance, subject to a 10 percent winter GVW allowance); (6) In Texas, given the purchase of the 5 percent tolerance policy annual permit, higher axle weight limits apply to most non-IS highways (*i.e.* all State roads and selected county roads). Texas' 5 percent tolerance permit is readily-available for any vehicle which is otherwise registered for 80,000 pounds GVW and is capable of operating at the higher GVW authorized by the permit (80,000 * 1.05 = 84,000 pounds). Within the permitted GVW limit of 84,000 pounds, a 10 percent tolerance on individual axle weights (*i.e.* 22,000, 37,400 and 47,850 pounds on single, tandem and tridem axles respectively) is allowed.

- Of a total of 9,607 IS miles in the nine corridor States, more than three-quarters are subject to 20,000- and 34,000-pound single and tandem axle weight limits year round. The 1,163 miles of IS in Missouri are subject to higher axle weight limits year round, while the 910 miles of IS in Minnesota have higher axle weight limits in the winter months.

- Tire load regulations vary in the nine corridor States. The implications of these differences are not known. What is known is that a variety of axle/tire configurations are used in each of the States, some of which serve the purpose of reducing the number/size of tires in ways never intended by the basic regulations.

- The defacto GVW limits in the corridor States vary from a year round 80,000-pound cap as follows: (1) in North Dakota, 105,500 pounds on all highways; (2) in South Dakota, 129,000 pounds on all highways; (3) in Nebraska, 95,000 pounds on all highways ; (4) in Minnesota, 88,000 pounds on all highways in winter months, based on a 10 percent weight allowance; (5) in Missouri, 22,400 pounds * number of axles in the four commercial zones; (6) in Kansas, 120,000 pounds on the Kansas Turnpike, 110,000 pounds on a short section of the I-70 connecting with Colorado, and 85,500 pounds on highways which are not IS; (7) in Oklahoma, 90,000 pounds on all highways; (8) in Texas, 84,000 on all non-IS highways. Only in Iowa is the 80,000-pound GVW limit applied on all highways year round.

- Important variations from the application of the provisions of Bridge Formula B in the corridor States are: (1) in North Dakota--a 10 percent winter weight allowance on axle weights, gross weight, and Bridge Formula requirements, on non-IS highways; (2) in North Dakota--the year round application of outer bridge only on non-IS highways; (3) in Minnesota--a 10 percent winter weight allowance on axle weights, gross weight, and Bridge Formula requirements, on all highways; (4) in Texas--the 5 percent tolerance permit overrides the provisions of Bridge Formula B creating a modified version of Bridge Formula B for operations on non-IS highways. There are a number of other minor variations between Bridge Formula B and the bridge formulas of the other corridor States.

Dimensions

- Width limits in the nine corridor States are 8.5 feet (2.60 m) except for non-NN highways in Missouri, which are limited to 8.0 feet.

- Height limits vary in the nine corridor States. There is a 14-foot height limit in North Dakota, South Dakota, Kansas, Texas, and Missouri (except on non-NN highways--13.5 feet, and on highways in commercial zones--15 feet). There is a 14.5-foot height limit in Nebraska. Heights are limited to 13.5 feet on all other highways in the corridor States.

- Semitrailer length limits vary in the nine corridor States. A 53-foot limit applies in North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Missouri (except on non-NN highways), and on non-NN highways in Oklahoma. Texas limits a semitrailer length to 59 feet. Kansas limits semitrailer lengths to 59.5 feet. Oklahoma limits semitrailer lengths to 59.5 feet (except on non-NN highways).

- Minnesota applies a kingpin setting restriction of 41 feet to the center of the rear tandem axle. None of the other corridor States--including the 59 and 59.5-foot semitrailer States of Texas, Oklahoma and Kansas--apply kingpin setting requirements nor any articulation performance requirements.

- North Dakota, South Dakota, Nebraska and Kansas permit the use of long combination vehicles/commercial motor vehicles on specified highway sections. Oklahoma also permits their use on all IS highways and other specified portions of the NN network. In Kansas, double and triple trailer combinations are allowed box lengths of 109 feet, except for operations under the "SVC" rules governing a short section of the I-70 joining Kansas to Colorado. Under the SVC rules, only triple trailer combinations may operate, with a maximum box length of approximately 95 feet. In practice, Kansas' enforcement officials are principally concerned that the overall length of these vehicles is less than or equal to 119 feet. In Oklahoma, box lengths of double and triple trailer combinations are limited to 110 and 95 feet respectively.

- Missouri allows long vehicles moving to or from Kansas to operate in the commercial zone of Kansas City, Missouri. These vehicles may be specially permitted to operate beyond the commercial zone, up to a maximum GVW of 80,000 pounds. There are differences between the provisions of the ISTEA freeze concerning Missouri and the related compliance requirements.

2.4.3 TS&W Regulations Governing Trucking in Manitoba

Manitoba's TS&W limits are specified in terms of five variables:

VARIABLE 1 basis of regulation	VARIABLE 2 vehicle class	VARIABLE 3 highway class	VARIABLE 4 season	VARIABLE 5 date of manufacture
RTAC	straight truck	RTAC	not-winter	
non-RTAC	truck & pony trailer	A1	winter	
	tractor-semitrailer	B1		
	tractor-semi-trailer (A-train)	A		
	tractor-semi-semi (B-train)	B		
	tractor-semi-trailer (C-train)	C		

Road classes A, B and C are not provincial highways. Class A is City of Winnipeg streets and classes B and C are municipal roads.

Weight

- Axle weight limits based on RTAC regulations are: (1) steering axle--5,500 kilograms on all roads (RTAC, A1 and B1); (2) single axle with dual tires--9,100 kilograms on RTAC and A1 highways, and 8,200 kilograms on B1 highways; (3) tandem axle--17,000 kilograms on RTAC highways, 16,000 kilograms on A1 highways, and 14,500 kilograms on B1 highways; (4) tridem axle--varies depending on axle spacing. For a spacing of 3.66 meters, the weight limit is 24,000 kilograms on RTAC highways, 23,000 kilograms on A1 highways, and 20,000 kilograms on B1 highways.

- Maximum GVW is subject to proper axle spacings and adequate tire and axle capacity. GVW limits by road type are: (1) on RTAC highways--62,500 kilograms; (2) on A1 highways--56,500 kilograms; and (3) on B1 highways--47,630 kilograms.

- Manitoba provides a winter weight allowance of 10 percent. The allowance: (1) does not apply to front steering axles; (2) applies to other single and tandem axles having dual tires: (3) does not apply to tridem axles; (4) does not apply to the 62,500 kg maximum GVW limit on RTAC highways: (5) does not apply to the 56,500 kg maximum GVW limit on A1 highways; (6) does not apply to the 47,630 kg maximum GVW limit on B1 highways; and (7) does not apply to the 10 kg/mm and 3,000 kg/tire limits.

Dimensions

- Manitoba limits the vehicle width to 2.6 meters on RTAC and B1 highways. The vehicle height is limited to 4.15 meters on the same highways.

- Vehicle lengths vary by vehicle type. Straight trucks are limited to an overall length of 12.5 meters on all highways (RTAC, A1 and B1). Full trailers are limited to 12.5 meters on all highways. Semitrailers are limited to 16.2 meters on all highways, based on RTAC regulations. The length of a semitrailer is not regulated based on Non-RTAC regulations.

- Tractor-double trailer combinations are limited to an overall length of 25 meters on all highways, based on RTAC regulations.

2.4.4 TS&W Regulations Governing Trucking in Mexico

Mexican regulations vary by: (1) road class; (2) axle configuration; (3) number of tires on an axle; (4) vehicle type; (5) number of tires on a vehicle; and (6) the presence or absence of air suspension.

Weights

- GVW limits on Class A2 and A4 Mexican highways for the truck types typically used in crossborder trucking are:

2-axle truck (6 tires)	17.5 tonnes (38,587 pounds)
3-axle truck (10 tires)	26.0 tonnes (57,330 pounds)
3+2 truck trailer (18 tires)	46.0 tonnes (101,430 pounds)
2-S2 tractor-semitrailer (14 tires)	35.5 tonnes (78,277 pounds)
3-S2 tractor-semitrailer (18 tires)	44.0 tonnes (97,020 pounds)
3-S3 tractor-semitrailer (22 tires)	48.5 tonnes (106,942 pounds)
2-S1-2 tractor-double (22 tires)	56.0 tonnes (123,480 pounds)

These GVW limits are increased by 5 percent when the vehicle is equipped with air suspension on all its axles, except the steering axle.

- Mexican regulations limit the allowable weight on a steering axle to 6.5 tonnes (14,300 pounds).

- Mexico prescribes a tire pressure limit of 6 kgf/cm^2 (0.586 MPa or 85 psi) when cold.

- Mexico's axle weight limits are 11.0 tonnes (24,255 pounds) on single drive axles, 10.0 tonnes (22,050 pounds) on single non-drive axles, 19.5 tonnes (42,997 pounds) on drive tandem axles, 18.0 tonnes (39,690 pounds) on non-drive tandem axles, and 22.5 tonnes (49,613 pounds) on non-drive tridem axles.

Dimensions

- Mexico limits the vehicle width to 2.6 meters and the height to 4.15 meters.

- Mexican regulations do not limit the length of a semitrailer.

- Mexico limits the combination length of a tractor-semitrailer to 20.8 meters (68.24 feet). This length permits the use of 53-foot semitrailers with both cab over engine (COE) and cab behind engine (CBE or conventional) tractors having a wheelbase of about 200 inches. This length does not allow the use of very long wheelbase tractors (say 244 inches).

- Mexican regulations do not specify limitations on kingpin settings.

References for Chapter 2

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3.0 Trucking Activity in the Corridor

This chapter is directed at understanding trucking activity in the corridor, with a view to facilitating the comparing and contrasting of TS&W policy options. To achieve this, it is necessary to understand the make-up of the truck fleet, commodity handlings, base and range of operations, truck volumes, on-road fleet mixes and characteristics of vehicles that move in the corridor (axle arrangements, body types, lift axles). This information is obtained from seven sources: (1) Truck Inventory and Use Survey (TIUS) data; (2) State and provincial flow and classification data; (3) the Emerson scale survey; (4) I-29 and I-35 on-road surveys; (5) the Manitoba-based truck load carrier survey; (6) surveys conducted by the Mexican Transportation Institute; and (7) U.S., Canada and Mexico Customs data.

3.1 Fleet Characteristics and Use based on TIUS Registration Data

This section presents truck fleet and use information developed from the 1992 and 1987 Truck Inventory and Use Surveys (TIUS) for the Mid-continent corridor States. TIUS data are allocated to individual States by place of registration. Appendix C contains a schematic illustration of the truck configurations that are used in this research.

3.1.1 Make-up of the truck fleet

Table 3-1 details the make-up of the truck fleet registered in the nine corridor States. This table was derived from Reference 5.

Nearly 80 percent of the truck fleet in South Dakota, Minnesota, Missouri and Kansas is made up of single unit trucks or combination units with four axles or less; three-quarters in Oklahoma and Nebraska; 70 percent in Iowa and Texas; and almost 90 percent in North Dakota. These compare to the nationwide figure of 80.6 percent.

Table 3-1
Truck Fleet in the Corridor States

Truck Type and Axle Arrangement		North Dakota 1992	North Dakota 1987	South Dakota 1992	South Dakota 1987	Nebraska 1992	Nebraska 1987	Minnesota 1992	Minnesota 1987	Iowa 1992	Iowa 1987	Missouri 1992	Missouri 1987	Kansas 1992	Kansas 1987	Oklahoma 1992	Oklahoma 1987	Texas 1992	Texas 1987
TOTAL FLEET		53490	55764	34344	31042	59758	68901	101655	91296	96145	81310	98597	98560	114193	104268	90982	83733	214408	247688
5 or More Axles	Sub-total	6898	5079	6310	4897	16060	18681	21126	15079	27370	18795	25910	19805	19590	14143	22235	17121	65345	57852
	% of total fleet	12.9	9.1	18.4	15.8	26.9	27.1	20.8	16.5	28.5	23.1	26.3	20.1	17.2	13.6	24.4	20.4	30.5	23.4
Truck + Trailer	Sub-total	553	842	379	379	889	1116	2145	1622	1264	291	1889	1457	1285	939	587	1289	5720	5683
	% of 5+ axle fleet	8.0	16.6	6.0	7.7	5.5	6.0	10.2	10.8	4.6	1.5	7.3	7.4	6.6	6.6	2.6	7.5	8.8	9.8
2+*3		0	324	77	126	107	137	184	385	513	0	521	294	259	243	164	599	683	2759
3+2		405	366	83	172	436	729	1209	781	662	291	1024	869	864	534	394	653	4666	2663
3+*3		40	73	48	56	145	67	374	187	30	0	174	294	116	162	0	36	223	261
*4+2		97	41	130	26	164	0	279	269	30	0	171	0	0	0	29	0	149	0
*4+*3		11	38	41	0	38	184	98	0	30	0	0	0	46	0	0	0	0	0
Tractor + Semitrailer	Sub-total	6072	4227	5698	4436	15077	16909	18673	13220	25810	18408	23730	18258	17749	12851	21415	15760	58660	51386
	% of 5+ axle fleet	88.0	83.2	90.3	90.6	93.9	90.5	88.4	87.7	94.3	97.9	91.6	92.2	90.6	90.9	96.3	92.1	89.8	88.8
2-*S3		97	19	56	17	94	76	47	106	202	170	221	153	0	1376	321	396	905	261
3-S2		5245	3570	4997	4149	13639	15755	15788	10964	23606	17235	22156	16988	16613	10804	19050	14238	52551	47082
3-*S3		359	469	279	111	707	591	1906	1294	1014	613	759	840	580	459	1578	802	3560	3130
4-S1		29	0	68	26	0	0	0	25	0	0	0	0	0	19	29	0	0	0
4-S2		131	102	215	133	354	395	505	438	722	291	569	277	463	174	379	252	1425	652
4-*S3		211	67	83	0	283	92	427	393	266	99	25	0	93	19	58	72	219	261
Tractor + Doubles	Sub-total	273	10	225	73	94	656	237	0	296	96	291	90	556	353	233	72	965	783
	% of 5+ axle fleet	4.0	0.2	3.6	1.5	0.6	3.5	1.1	0.0	1.1	0.5	1.1	0.5	2.8	2.5	1.0	0.4	1.5	1.4
2-S1-2		11	10	25	0	38	479	95	0	237	0	120	30	417	260	29	0	743	652
3-S1-2		12	0	33	55	18	177	118	0	29	96	171	60	93	93	88	72	0	131
2-S2-2		68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-S2-2		148	0	66	0	38	0	0	0	0	0	0	0	23	0	29	0	0	0
other @ *7-axle		0	0	0	9	0	0	0	0	0	0	0	0	23	0	0	0	0	0
3-S2-3		0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	74	0
other @ *8-axle		11	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	74	0
3-S2-4		23	0	8	9	0	0	0	0	0	0	0	0	0	0	87	0	74	0
other @ *9-axle		0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0
other @ *10-axle		0	0	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tractor + Triples	Sub-total	0	0	8	9	0	0	71	0	0	0	0	0	0	0	0	0	0	0
	% of 5+ axle fleet	0.0	0.0	0.1	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2-S1-2-2		0	0	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-S1-2-2		0	0	0	0	0	0	71	0	0	0	0	0	0	0	0	0	0	0
other		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less Than 5 Axles	Sub-total	46591	50684	28034	26146	43700	50220	80528	76454	68776	62516	78319	78756	94603	90125	68747	66613	149064	189836
	% of total fleet	87.1	90.9	81.6	84.2	73.1	72.9	79.2	83.7	71.5	76.9	79.4	79.9	82.8	86.4	75.6	79.6	69.5	76.6
Single Unit Trucks	Sub-total	45347	49589	26491	25273	40749	47835	73792	70608	63825	56943	70568	70533	89105	84667	61902	57012	125896	156326
	% of total fleet	84.8	88.9	77.1	81.4	68.2	69.4	72.6	77.3	66.4	70.0	71.6	71.6	78.0	81.2	68.0	68.1	58.7	63.1
2 Axles		31708	38290	20510	21342	30010	38451	51583	52730	46923	44335	54536	57259	71105	72933	52359	47447	103814	128558
3 Axles		12725	10562	5474	3681	9998	8558	19267	16255	15759	12143	15110	13087	17254	11472	9004	8962	20988	27507
4 Axles		914	737	507	250	741	826	2942	1623	1143	465	922	187	746	262	539	603	1094	261
Truck + Trailer	Sub-total	627	140	831	143	951	548	2935	2183	1611	1260	3374	1313	1744	1234	2112	4518	8437	14329
	% of total fleet	1.2	0.3	2.4	0.5	1.6	0.8	2.9	2.4	1.7	1.5	3.4	1.3	1.5	1.2	2.3	5.4	3.9	5.8
2 + 2		627	140	831	143	951	548	2935	2183	1611	1260	3374	1313	1744	1234	2112	4518	8437	14329
Tractor + Semitrailer	Sub-total	617	955	712	730	2000	1837	3801	3663	3340	4313	4377	6910	3754	4224	4733	5083	14731	19181
	% of total fleet	1.2	1.7	2.1	2.4	3.3	2.7	3.7	4.0	3.5	5.3	4.4	7.0	3.3	4.1	5.2	6.1	6.9	7.7
2-S1		292	48	275	172	411	351	962	1379	1130	868	1239	2933	1473	1530	1166	1710	4024	5723
2-S2		274	780	387	425	1513	1192	2670	2047	2121	3101	2993	3606	2142	2254	2674	2302	10187	11077
3-S1		51	127	50	133	76	294	169	237	89	344	145	371	139	440	893	1071	520	2381

* Note: Excludes pickups, mini-vans, utility sports, station wagons, trucks or truck-tractors with 4-tires, and trucks pulling 1-axle trailer or 1-axle utility trailer

Source: U.S. DOT Comprehensive Truck Size and Weight Study, (Report No. 2) "Analysis of the Truck Inventory and Use Survey from the Truck Size and Weight Perspective for Trucks with Five-Axles or more", February, 1996.

In 1992, the nine corridor States accounted for 1 of every 4.5 trucks of both the total national fleet, and the national fleet having five axles or more. [Ref. 1]. There are significant differences in the percentages of the total truck fleets registered in the corridor States having five axles or more. These combinations account for 1 of 7.8 registered trucks in North Dakota, 1 of 5.4 in South Dakota, 1 of 3.7 in Nebraska, 1 of 4.8 in Minnesota, 1 of 3.5 in Iowa, 1 of 3.8 in Missouri, 1 of 5.8 in Kansas, 1 of 4.1 in Oklahoma, and 1 of 3.3 in Texas.

For these trucks with five axles or more in the nine States combined:

- Tractor-semitrailer combinations are most common. They account for 8.8 of 10 in North Dakota, 9.0 of 10 in South Dakota, 9.4 of 10 in Nebraska, 8.8 of 10 in Minnesota, 9.4 of 10 in Iowa, 9.2 of 10 in Missouri, 9.1 of 10 in Kansas, 9.6 of 10 in Oklahoma, and 9 of 10 in Texas (compared to 87 percent nationwide).

- Truck-trailers are the next most common. They account for 8.0 percent in North Dakota, 6.0 percent in South Dakota, 5.5 percent in Nebraska, 10.2 percent in Minnesota, 4.6 percent in Iowa, 7.3 percent in Missouri, 6.6 percent in Kansas, 2.6 percent in Oklahoma, and 8.8 percent in Texas (compared to 7 percent nationwide).

- Tractor-double trailer combinations follow. They account for 4.0 percent in North Dakota, 3.6 percent in South Dakota, 0.6 percent in Nebraska, 1.1 percent in Minnesota, Iowa and Missouri, 2.8 percent in Kansas, 1.0 percent in Oklahoma, and 1.5 percent in Texas (compared to 5 percent nationwide).

- In the nine corridor States, tractor-triple trailer combinations are shown to be registered only in Minnesota (where they are not allowed) and in South Dakota. None are shown to be registered in States where they are allowed (Kansas and Oklahoma).

3.1.2 Commodity Handlings [Ref. 1]

This section references data from the State data reports relating to the TIUS database. It considers truck fleet data for each State excluding pickups, panels, vans, utilities and station wagons. It includes only data from Column D of the TIUS reports.

Table 3-2 lists the principal product handlings of the corridor State trucks. In the TIUS database, the "principal product" identified as being hauled by a given truck is the product most often hauled by that truck, based on vehicle miles travelled (VMT). Trucks identified in TIUS as "personal transport, no load carried, not in use, other and craftsman's equipment" were removed to establish the total trucks of interest to this analysis. For the corridor States combined:

- Almost one-quarter of the 875,000 trucks of interest are used principally for the transportation of farm products.
- An additional 39 percent are used principally for the transportation of building materials (1 of every 8 trucks), processed foods (1 of every 6), live animals (1 of 19), and petroleum (1 of 21).
- Other important principal product handlings are transportation equipment, machinery, mixed cargoes, chemicals, fabricated metals, and scrap/refuse.

Table 3-2

1992 Commodity Handlings of TIUS Column D Trucks in the Corridor States

(Data shows number of Column D trucks in thousands)

(Number in [brackets] is the rank by frequency of observations in "Trucks of Interest")

Commodity	North Dakota	South Dakota	Nebraska	Minnesota	Iowa	Missouri	Kansas	Oklahoma	Texas	Total
Total Column D Trucks	66.0	40.5	73.0	120.3	111.5	126.2	145.3	114.9	264.5	1062.2
Craftsman equipment	1.1	0.8	2.4	6.3	4.1	6.4	6.2	4.4	15.4	47.1
Personal transport	3.5	1.2	0.9	5.8	3.1	3.0	5.1	2.8	5.8	31.2
No load carried	2.6	0.7	2.5	3.9	3.2	5.0	6.7	7.3	22.7	54.6
Not in use	2.2	1.1	1.3	3.3	4.2	1.4	10.8	8.1	8.3	40.7
Other	1.0	0.6	0.5	1.9	0.6	1.1	2.6	1.7	3.6	13.6
Trucks of interest	55.6	36.1	65.4	99.1	96.3	109.3	113.9	90.6	208.7	875.0
Farm products	4.3[2]	2.9[3]	5.4[4]	30.8 [1]	27.9 [1]	22.7 [1]	49.2 [1]	20.3 [1]	19.9 [3]	183.4
Processed foods	36.7[1]	16.3[1]	25.0[1]	8.7[3]	8.9[3]	12.5 [3]	7.6[4]	6.1[4]	23.6 [2]	145.4
Building materials	2.1[4]	1.7[4]	5.7[3]	15.0 [2]	12.5 [2]	15.5 [2]	12.5 [2]	9.0[2]	32.8 [1]	106.8
Live animals	0.4	0.5	4.3[5]	3.7	6.6[4]	6.0[5]	8.6[3]	6.0[5]	8.8	44.9
Petroleum	1.1[5]	0.7	2.4	3.7	3.1	5.1	5.5[5]	5.4	13.8 [5]	40.8
Machinery	1.1	0.6	1.9	4.2[5]	5.3[5]	4.3	4.1	4.8	10.7	37.0
Mixed cargoes	0.3	0.7	0.8	3.4	2.7	6.9[4]	3.0	3.1	15.9 [4]	36.0
Transport equipment	0.3	0.3	0.7	4.7[4]	3.2	3.7	2.0	7.4[3]	11.1	33.4
Fabricated metal	3.6[3]	4.1[2]	5.8[2]	1.8	3.0	3.1	(S)	1.1	8.4	30.9
Chemicals	1.1	1.1[5]	2.0	3.0	4.9	3.8	2.6	3.2	7.9	29.6
Scrap, refuse	0.9	1.7[4]	2.3	3.1	1.1	3.4	3.8	2.4	7.4	26.1
Other	3.7	5.5	9.1	17.0	17.1	22.3	15.0	21.8	48.4	159.9

Source: Individual State TIUS Reports

Truck usage by the three major commodity groups in each State is:

- North Dakota: About two-thirds of the trucks hauls principally processed foods, 1 of 13 hauls farm products, 1 of 15 hauls fabricated metals.
- South Dakota: 1 of 2 trucks hauls principally processed foods, 1 of 9 hauls fabricated metals, 1 of 12 hauls farm products.
- Nebraska: 1 of 3 trucks hauls principally processed foods, 1 of 11 hauls fabricated metals, 1 of 11 hauls building materials.
- Minnesota: 1 of 3 trucks hauls principally farm products, 1 of 7 hauls building materials, 1 of 11 hauls processed foods.
- Iowa: 1 of 3 trucks hauls principally farm products, 1 of 8 hauls building materials, 1 of 11 hauls processed foods.
- Missouri: 1 of 5 trucks hauls principally farm products, 1 of 7 hauls building materials, 1 of 9 hauls processed foods.
- Kansas: about 1 of 2 trucks hauls principally farm products, 1 of 9 hauls building materials, 1 of 13 hauls live animals.
- Oklahoma: 1 of 5 trucks hauls principally farm products, 1 of 10 hauls building materials, 1 of 12 hauls transportation equipment.
- Texas: 1 of 6 trucks hauls principally building materials, 1 of 9 hauls processed foods, 1 of 10 hauls farm products.

3.1.3 Base and Range of Operation

Table 3-3-a shows the percentage of mileage driven outside of the home base State by TIUS Column D trucks registered in each State. Table 3-3-b shows the range of operation of TIUS Column D trucks registered in each State.

For the corridor States combined, excluding the "not reported" category:

Table 3-3-a
1992 Base of Operation for TIUS Column D Trucks in Corridor States
(Data shows number of Column D trucks in thousands)

MIles Driven Outside Base State (in percent)	North Dakota	South Dakota	Nebraska	Minnesota	Iowa	Missouri	Kansas	Oklahoma	Texas
Less than 25	52.6	29.7	50.9	95.7	79.4	90.9	112.6	80.2	204.6
25 to 49	1.2	1.2	1.8	2.9	4.2	5.5	4.6	2.5	7.2
50 to 74	1.5	0.9	1.8	4.8	4.6	4.7	4.0	3.6	7.4
75 to 100	2.1	1.9	4.5	5.7	10.3	9.7	6.0	7.0	6.6
No home base	0.9	1.4	3.7	1.6	4.6	3.9	12.3	7.5	5.2
Not reported	7.7	5.4	10.3	11.1	13.0	11.5	5.8	14.1	33.5
Total Column D Trucks	66.0	40.5	73.0	120.3	111.5	126.2	145.3	114.9	264.5

Source: Individual State TIUS Reports

Table 3-3-b
1992 Range of Operation for TIUS Column D Trucks in Corridor States
(Data shows number of Column D trucks in thousands)

Typical Trip Length from Home Base (in miles)	North Dakota	South Dakota	Nebraska	Minnesota	Iowa	Missouri	Kansas	Oklahoma	Texas
Local<50 miles home	43.7	23.4	44.1	75.0	64.4	75.2	86.1	53.5	138.7
50-100 miles home	4.2	3.6	7.2	13.8	12.2	15.7	10.9	12.6	43.5
100 to 200 miles home	2.0	1.8	3.1	5.9	5.3	5.9	4.7	6.4	16.7
200 to 500 miles home	1.5	1.0	2.2	4.5	5.8	5.3	6.0	4.8	19.1
>500 miles	2.5	3.0	8.0	6.7	11.2	12.8	6.1	12.8	15.5
off the -road	10.8	6.8	7.8	11.3	9.8	10.3	26.6	17.7	24.5
not reported	1.2	0.9	0.7	3.1	2.7	0.9	5.0	7.1	6.4
Total Column D Trucks	66.0	40.5	73.0	120.3	111.5	126.2	145.3	114.9	264.5

Source: Individual State TIUS Reports

Table 3-3-c
1992 Average Gross Vehicle Weight (GVW) for TIUS Column D Trucks in Corridor States
(Data shows number of Column D trucks in thousands)

Average GVW (in pounds)	North Dakota	South Dakota	Nebraska	Minnesota	Iowa	Missouri	Kansas	Oklahoma	Texas
40,000 or less	49.4	30.1	49.8	83.5	75.7	87.1	113.3	84.3	181.9
40,001-60,000	10.7	5.9	11.3	18.9	14.2	16.8	17.0	12.7	32.5
60,001-80,000	5.1	4.0	10.9	17.4	21.1	22.2	13.9	17.0	48.8
80,001-100,000	0.4	0.4	1.0	0.3	0.4	(S)	1.0	1.1	1.2
100,001-130,000	0.2	0.1	(S)	0.1	(S)	(Z)	(S)	(Z)	0.3
130,001 or more	(Z)	(S)	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)
not reported	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)
Total Column D Trucks	66.0	40.5	73.0	120.3	111.5	126.2	145.3	114.9	264.5

(S) Data withheld because estimate did not meet Bureau of Census publication standards
(Z) Reported data represents less than 50 trucks or 0.05 percent

Source: Individual State TIUS Reports

- Most trucking occurs within the base State. Nearly 9 of 10 trucks drive less than 25 percent of their mileage outside of the home State. About 1 of 18 trucks drives from 75 to 100 percent of their mileage outside the base State.

- Most trucking occurs within 200 miles of home. Nearly 9 of 10 truck trip lengths are within this distance of home or off-the-road. About 1 of 21 trucks operates in the 200 to 500 mile range, with another 1 of 13 having trip lengths greater than 500 miles.

3.1.4 Average Weight Characteristics [Ref. 1]

Table 3-3-c shows the average gross vehicle weight (empty weight plus cargo weight) of TIUS Column D trucks for each State. For the corridor States combined, excluding the "not reported" category:

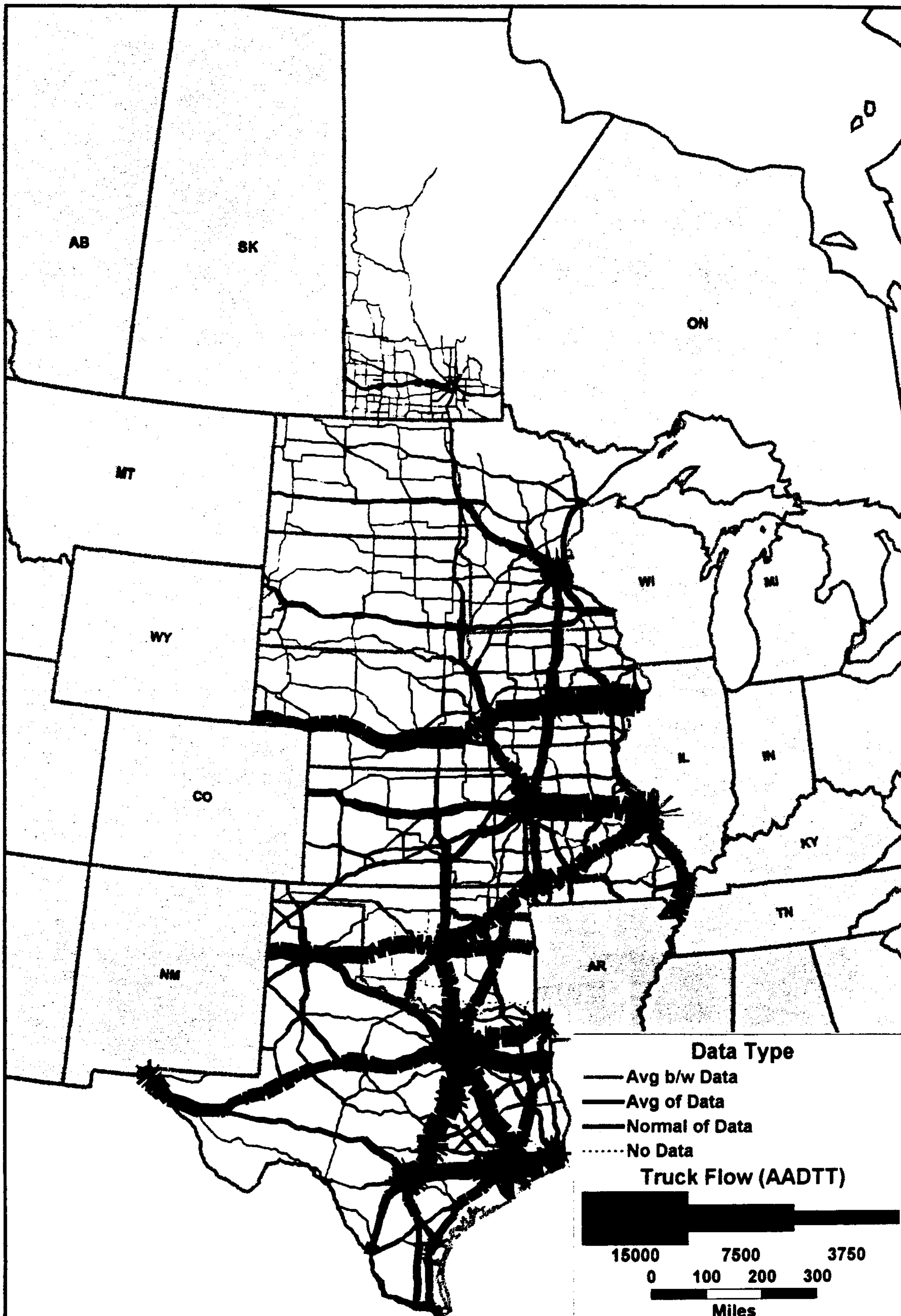
- Effectively all trucking occurs at weight levels requiring five or less axles. About 7 of 10 truck movements occur at an average GVW of less than 40,000 pounds, which generally requires no more than three axles; 84.3 percent occurs at average weight levels less than 60,000 pounds GVW, which generally requires no more than four axles; 99.4 percent occurs at average weight levels less than 80,000 pounds GVW, which generally requires no more than five axles.

- Hardly any trucking occurs at weight levels requiring more than five axles. About 0.5 percent occurs at GVWs between 80,001 and 100,000 pounds, probably requiring six or seven axles. Less than 0.01 percent occurs at GVWs greater than 100,000 pounds, probably requiring eight or nine axles.

3.2 Truck Flows Based on State and Provincial Data

In order to better understand the implications of trucking in a region, consideration should be given to the quantities and types of vehicles that move on a highway. Figure 3-1 shows total truck flows on all NHS highways within the corridor States and on all highways of the PTH system in Manitoba. [Ref. 1]. This figure was developed based on State and provincial data as part of this and related research. The methodology used to develop the map is outlined in Reference 1.

Figure 3-1
Heavy Commercial Vehicle Flows in the Mid-Continent Corridor



Source: State and Provincial Classification Data

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Appendix B presents truck flow maps for the individual corridor States and Manitoba. The following observations are drawn from this map:

- The highest truck volumes in Manitoba occur on PTH 1 west of Winnipeg. These volumes are approximately equivalent to those observed on I-29 between Grand Forks and Fargo.

- Truck volumes in Manitoba are minor compared to the volumes registered south of Fargo, North Dakota for the nine corridor States.

- The lowest truck volume along the I-29 route occurs south of the Manitoba-U.S. border--approximately 450 average annual daily truck traffic (AADTT), compared to 739 trucks per day that cross the Manitoba-U.S. border at the Pembina-Emerson crossing. The highest truck volume occurs just north of Omaha, Iowa--approximately 2,980 AADTT.

- The dominance of the Interstate highways, and the relative importance of one Interstate to the other, is self-evident in the map. East-west truck movements are much larger than north-south truck movements in the corridor States.

- The lowest truck volumes along the I-35 route occur at its two ends and in its middle:

  - between Minneapolis, Minnesota and Duluth, Minnesota (about 1,450 AADTT)
  - on the east side of Wichita, Kansas (about 1,750 AADTT)
  - between Laredo, Texas and Cotulla, Texas (about 1,700 AADTT)

- Most of the north-south trucking activity--in terms of truck volumes--takes place between Oklahoma City and San Antonio, being Dallas-San Antonio the link that shows the highest truck volumes in the corridor.

- While much of the non-IS mileage in the NHS system in the corridor States has low truck volumes, certain of this mileage has high truck volumes:

  - U.S. 287/81 between Amarillo, Texas and Dallas, Texas.

  - U.S. 281 and U.S. 77 between I-37 and the U.S.-Mexico border, and U.S. 77/59 between Corpus Christi, Victoria, Houston and north to the I-20/I-30.

  - U.S. 82 between Minneapolis, Minnesota and Rochester, Minnesota.

3.3 Fleet Characteristics Based on State Classification Data

State-developed classification data concerning operations on the I-29 and I-35 were obtained and analyzed for South Dakota, Iowa, Kansas, Oklahoma and Texas. Figure 3-2 shows the locations where the classification data were obtained. Appendix C presents tables, maps and detailed discussions regarding these classification data for the corridor States. The discussion in the appendix shows: (1) the counter number; (2) the counter location; (3) the year of classification (all 1994 or 1995, except 1990 in Oklahoma); (4) the AADT and AADTT at the given location; and (5) the breakdown of the percent trucks into FHWA vehicle classes 4 to 13 inclusive for selected stations.

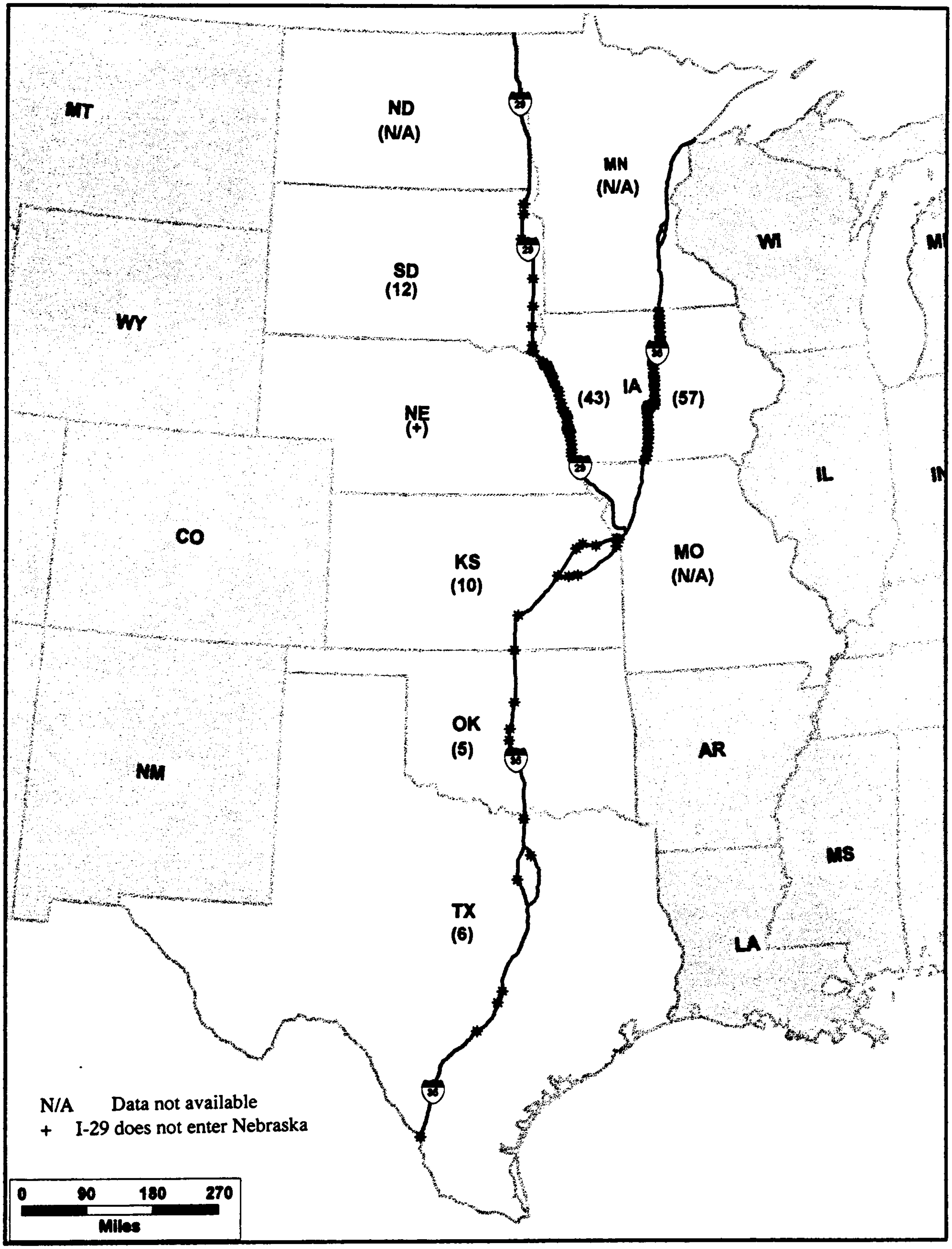
The following observations are drawn from the data:

3.3.1 South Dakota

Data are available at 12 classification locations on the I-29 in South Dakota--9 at rural sites and 3 at urban sites. Two sites, which are shown in Table C-1 in Appendix C, illustrate the full range of vehicle classifications along this route. Site 2--north of State highway 15--is the location with the smallest proportion of straight axle trucks (11.71 percent of the observed fleet). Site 11--located north of Exit 4--is the location with the largest proportion of straight axle trucks (22.14 percent of the observed fleet). From the analysis the following was obtained:

- Five-axle tractor-semitrailers dominate, accounting for between 48 and 55 percent of the observed fleet at the two locations.
- Double trailer combinations account for between 2 and 5 percent of the observed fleet at the two locations.
- Six-axle tractor-semitrailers and truck + trailer account for between 2 and 10 percent of the observed fleet at the two locations.

Figure 3-2
Locations of State Classification Data Collection



Source: Vehicle Classification Count Summary from the Individual States *November, 1996 - UMTIG©*

3.3.2 Iowa

Data are available at 43 classification locations on the I-29 in Iowa--24 at rural sites and 19 at urban sites. Two sites, which are shown in Table C-2, illustrate the full range of vehicle classifications along this route. Site 17--at the Nebraska street and Pierce street interchange--is the location with the largest proportion of straight axle trucks (26.35 percent of the observed fleet). Site 55--located north of the Missouri-Iowa State line--is the location with the smallest proportion of straight axle trucks (9.19 percent of the observed fleet). From the analysis the following was obtained:

- Five-axle tractor-semitrailers dominate, accounting for between 56 and 63 percent of the observed fleet at the two locations.
- Double trailer combinations account for about 5 percent of the observed fleet at the two locations.
- 3/4-axle tractor semitrailers account for about 12 percent of the observed fleet in urban areas and for almost 20 precent of the fleet in rural areas.
- Six-axle tractor-semitrailers and truck + trailer account for between 1.34 and 1.94 percent of the observed fleet at the two locations.

Data are available at 57 classification locations on the I-35 in Iowa--48 at rural sites and 9 at urban sites. Two sites, which are shown in Table C-3, illustrate the full range of vehicle classification along this route. Site 42--on the Des Moines bypass--is the location with the largest proportion of straight axle trucks (26.18 percent of the observed fleet). Site 57--on the Iowa-Missouri border--is the location with the smallest proportion of straight axle trucks (11.89 percent of the observed fleet). The analysis shows the following:

- Five-axle tractor-semitrailers dominate, accounting for between one-half and 60 percent of the observed fleet at all locations.
- Double trailer combinations (STAA and all others) account for between 5 and 6 percent of the observed fleet at all locations.

- 3/4-axle tractor-semitrailers and truck + trailer combinations account for between 15 and 19 percent of the observed fleet at all locations.

- Six-axle tractor semitrailers and truck + trailer combinations are uncommon, accounting for between 1.5 and 2 percent of the observed fleet at all locations.

3.3.3 Kansas

Data are available at 10 classification locations on the I-35 and the Kansas Turnpike in Kansas--5 at rural sites (Table C-4-a) and five at urban sites (Table C-4-b). Based on the analysis of the data from these ten classification sites along the I-35 and Kansas Turnpike in Kansas: [Ref. 1].

- Straight trucks (principally 2/3 axles, with some 4/5 axle) account for between 10 and 15 percent of the observed fleet--except close to Kansas City where they account for one-third to about 40 percent.

- Large double trailer combinations having 7 axles or more (class 13) account for: (1) about 2 percent of the truck traffic on the I-70 just west of Kansas City (about 125 units per day); (2) about 13 percent of the truck traffic on the I-335 between Topeka and Emporia (about 175 units per day on this link); (3) about 2.5 percent of the truck traffic on the (rural) I-70 between Lawrence and Topeka (about 100-110 units per day on this link); and (4) about 4 percent of the truck traffic on the I-35 close to Wichita (about 80 units per day).

- STAA double trailer combinations account for between 3 and 5 percent of the observed fleet on urban interstates, and 4.9 and 9 percent on rural Interstates.

- 3/4-axle tractor-semitrailers and truck + trailer combinations account for between a low of 6 percent (away from urban areas) and nearly one-quarter (close to urban areas) of the observed fleet at these ten different classification sites.

- Configurations with tridem axles are uncommon, accounting for between 0.3 and 2 percent of the observed fleet at these sites.

3.3.4 Oklahoma

Data are available for five classification locations on the I-35 in Oklahoma--three at rural sites and two at urban sites (Table C-5). The results of the analysis of the data at these locations is summarized below: [Ref. 1].

- Straight trucks (effectively all 2/3-axle) account for between 10 and 15 percent of the observed fleet at rural sites, and about one-quarter of the observed fleet near Oklahoma City.

- Five-axle tractor-semitrailers (combined with some 6-axle units) dominate the truck fleet, accounting for about two-thirds of the observed fleet at urban sites, and nearly 80 percent of the observed fleet at rural classification sites.

- Double trailer combinations (STAA and all others) account for between 1.3 and 3.4 percent of the observed fleet at the five classification sites.

- 3/4-axle tractor-semitrailers (class 8) and truck + trailer combinations account for between 3 and 6 percent of the observed fleet at these five different classification sites.

3.3.5 Texas

Data are available at six classification locations on the I-35 in Texas--two at rural sites and four at urban sites. Results of the analysis of the data at these locations is summarized in Table C-6. [Ref. 1].

- Straight trucks (effectively all 2/3-axle) account for about 30 percent of the observed fleet--from a low of about 15 percent in Laredo to a high of more than 40 percent on the south side of Fort Worth.

- Five-axle tractor-semitrailers dominate the fleet mix, accounting for about 60 percent of the observed fleet--from a high of about three-quarters at Laredo to a low of about 47 percent on the south side of Fort Worth.

- STAA double trailer combinations account for between 1.5 and 4.6 percent of the observed fleet at all classification locations.

- 3/4-axle tractor-semitrailers and truck + trailer combinations account for between 6 and 8 percent of the observed fleet.

3.4 Fleet Characteristics Based on Field Surveys

Four field surveys are analyzed in this section. These surveys provide additional information regarding vehicle characteristics in the corridor. The first is the Emerson Scale Survey, conducted at a static weigh scale in Emerson, Manitoba between February and August, 1996. The second is a Manitoba-based truck load carrier survey conducted in October, 1996. The third survey is an on-road survey conducted on the total length of I-29 and I-35 between April and August, 1996. These three surveys were conducted as part of this and related research. The fourth survey was conducted by the Mexican Transportation Institute near the U.S.-Mexico border in 1994.

3.4.1 Emerson Scale Survey

To better understand the truck activity to and from Manitoba, an extensive survey (three parts) was conducted at the Emerson Scale. The first part of the survey was conducted from February 12 to February 18, 1996. The second part took place from June 5 to June 15, 1996; and the last part was conducted from August 14 to August 15, 1996. All days of the week were covered by each survey, as well as the times of the day. The survey includes information on: (1) origin-destination of trucks going through the scale; (2) name of carriers; (3) base of operation of those carriers; (4) vehicle configuration; (5) body types of the vehicles; (6) loading conditions--whether the truck is operating empty or loaded; (7) axle group weights; (8) commodities being hauled; and (9) routing from origin to destination. A copy of the questionnaire used in this survey is included in Appendix D.

Truck crossings through the Emerson-Pembina port of entry were obtained from Canada Customs and U.S. Customs for the specific days on which the survey was conducted. According to both U.S. and Canada Customs, for the 20 days of the survey combined, the total two-way truck traffic moving through the Pembina-Emerson crossing was 13,802 trucks (6,843 northbound and 6,959 southbound). The survey at the scale classified 3,922 of these trucks. This represents more than one-quarter of the total truck traffic through the Emerson-Pembina crossing. Of the 3,922 trucks classified, 966 of the truck drivers were personally interviewed. This represents 7 percent of the movements through the Emerson-Pembina crossing for the three weeks combined. Figure 3-3 shows the size of the survey in relation to the total number of trucks that moved across the border according to U.S. and Canada Customs.

The analysis begins by obtaining results about general aspects of the survey for all trucks that were classified. This includes obtaining information regarding loading distribution (whether the trucks were empty or loaded), direction of movement (northbound or southbound), configurations and body types of all trucks moving through the scale. The next part of the analysis considers only the trucks that were carrying a load. It distinguishes between northbound and southbound movements for these trucks and presents fleet characteristics by direction. The last portion of the analysis discusses the weight distribution of the loaded trucks by direction of travel.

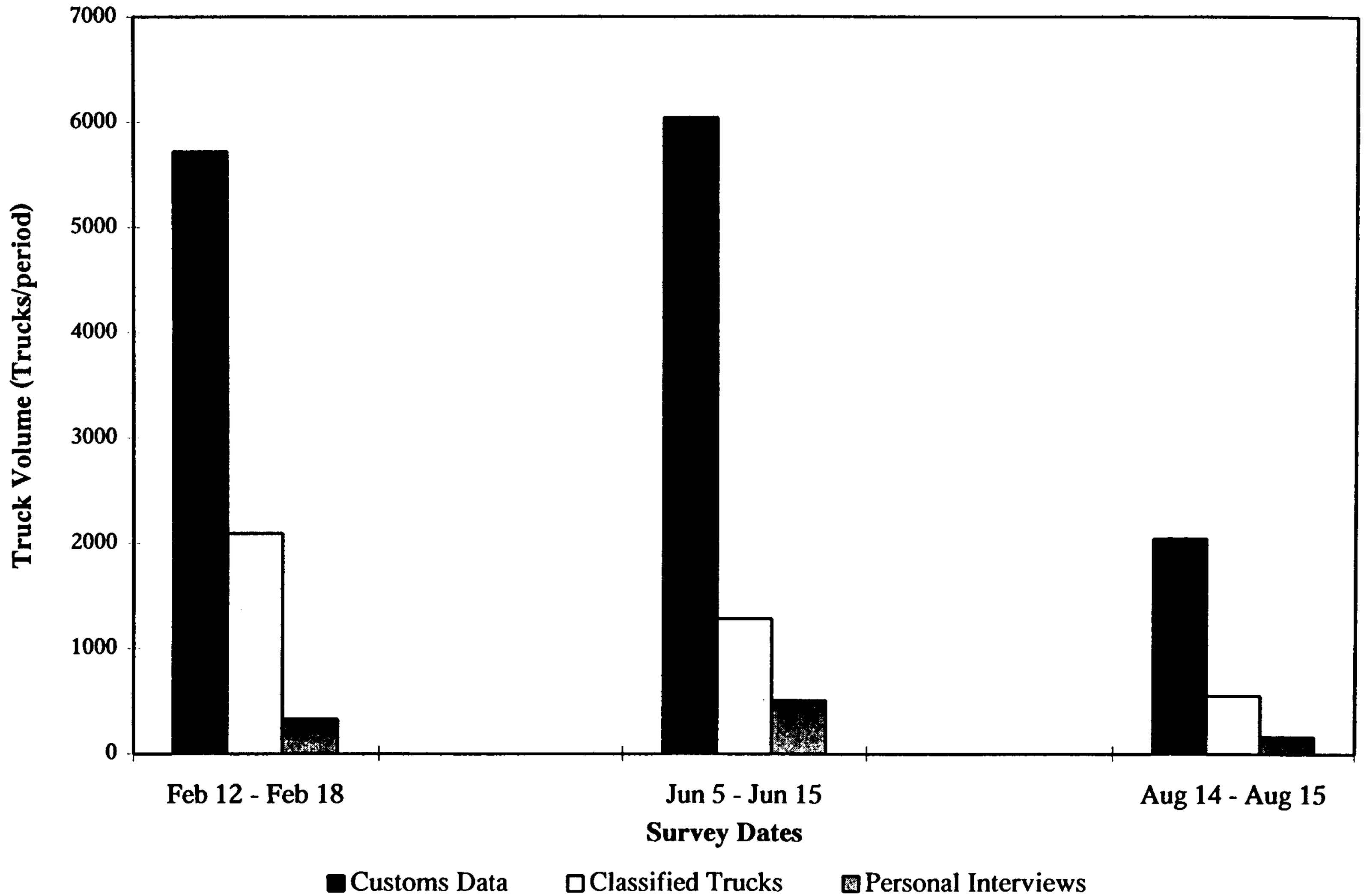
Of the total 3,922 trucks that were classified:

- 2,687 (68.5 percent) were loaded, 774 (19.7 percent) were empty, and loading conditions were unknown for the remaining 461 (11.8 percent) trucks.

- 1,807 (46.1 percent) were traveling northbound, 1,819 (46.4 percent) were traveling southbound, and the direction of travel was unknown for 296 (7.5 percent) trucks.

- The fleet is as follows: 2-, 3-, and 4-axle straight trucks combined account for 2.7 percent; 3-S2s account for 85.7 percent; 3-S3s account for 2.1 percent; 7- and 8-axle B-trains combined account for 1.8 percent; A-trains are almost as common as B-trains. They account for about one percent of the total fleet. other configurations account for 6.7 percent.

Figure 3-3
Truck Volumes by Source for the Emerson Scale Survey



Source: U.S. and Canada Customs and Emerson Scale Survey

Prepared by J. Montufar - 30/11/96

- The truck plus trailer fleet is minimal. Less than one percent of the classified trucks were truck plus trailers with 4, 5 or 6 axles.

- No triple trailer combinations were obtained during the survey periods.

- Vans account for 42.7 percent of the fleet (one-quarter of those vans are equipped with refrigerating units); flat beds account for 18.9 percent of the trucks surveyed; grain bodies account for 16.3 percent; livestock trucks account for 9.5 percent; other body types account for 12.6 percent of the trucks surveyed. Table 3-4 shows the truck fleet distribution by configuration and body type for all trucks classified.

- Of the 319 hopper bottom (grain and dry bulk tank) trucks operating southbound, 80 percent were loaded, 5 percent were empty, and loading conditions were unknown for the remaining 15 percent. Of the 310 hopper bottom truck operating northbound, more than one-quarter were operating empty, about three-quarters were carrying a load, and loading conditions were unknown for less than one percent of those trucks. The direction of operation was unknown for the remaining 8 percent of hopper bottom trucks operating through the Emerson scale.

- Of the 197 livestock trucks operating southbound, three-quarters were loaded, 7 percent were empty, and loading conditions were unknown for the remaining 19 percent. Of the 154 livestock truck operating northbound, 8.6 of 10 were empty, about 1 of 12 was loaded, and loading conditions were unknown for 1 of 17 of those trucks. The direction of operation was unknown for the remaining 7 percent of livestock trucks operating through the Emerson scale.

- Almost 40 percent of the B-trains are grain bodies. About one-third are tank trucks with liquids or gas.

- The major carriers operating at the Emerson scale are (1) Penner International; (2) Bison Transport; (3) Southeast Transport, now called Big Freight Systems Inc.; (4) Transx; (5) Yanke (6) Kleysen Transport; (7) Gershman Transport; and (8) Arnold Brothers Transport. These eight carriers account for about 20 percent of the classified movements at the scale.

For the 2,687 loaded trucks that were classified:

- 1,167 (43.4 percent) were traveling northbound, 1,292 (48.1 percent) were traveling southbound, and the direction of travel was unknown for 228 (8.5 percent) trucks.

Table 3-4
Truck Fleet Distribution at the Emerson Scale by Body Type
All Trucks

Body Type	2/3/4-axle Straight	2-S1/2-S2	3-S1	3-S2	3-S3	3-S2-S2	3-S3-S2	3-S2-2	2/3-S1-2	Truck + Trailer	Unknown	Other	Total	Percentage
Van	70	3	7	1099	8	2	1	15	41	0	0	7	1253	32%
Refrigerated Van	4	1	0	417	0	0	0	0	1	0	0	0	423	11%
Pole, Logging	0	0	0	9	0	0	0	0	0	0	0	1	10	<1%
Container	0	0	0	13	0	0	0	0	1	0	0	2	16	<1%
Platform	8	6	4	688	23	1	5	0	1	1	2	3	742	19%
Tank Truck, Liquids or Gas	1	0	0	137	12	6	16	2	1	0	1	7	183	5%
Tank Truck Dry Bulk	0	0	0	28	2	1	1	7	0	0	0	2	41	1%
Dump Truck	1	0	0	4	0	0	0	0	0	0	0	0	5	<1%
Grain Bodies (hopper)	3	1	0	582	19	1	27	5	0	0	2	1	641	16%
Garbage Truck	0	0	0	2	0	0	0	0	0	0	0	0	2	<1%
Auto Transport	1	2	0	11	0	0	0	0	0	1	1	0	16	<1%
Livestock	4	4	1	340	19	0	1	0	0	0	2	0	371	9%
Unknown	3	0	0	28	1	0	0	1	2	1	143	17	196	5%
Other	4	0	0	2	0	0	7	0	0	0	3	7	23	1%
Total	99	17	12	3360	84	11	58	30	47	3	154	47	3922	100%
Percentage	3%	<1%	<1%	86%	2%	<1%	1%	1%	1%	<1%	4%	1%	100%	

Source: Emerson Scale Survey - February, June and August 1996

Table 3-5
Truck Fleet Distribution at the Emerson Scale by Body Type
Loaded Trucks Only

Body Type	2/3/4-axle Straight	2-S1/2-S2	3-S1	3-S2	3-S3	3-S2-S2	3-S3-S2	3-S2-2	2/3-S1-2	Truck + Trailer	Unknown	Other	Total	Percentage
Van	29	3	3	765	4	1	0	7	27	0	0	0	839	31%
Refrigerated Van	3	1	0	321	0	0	0	0	1	0	0	0	326	12%
Pole, Logging	0	0	0	9	0	0	0	0	0	0	0	0	9	<1%
Container	0	0	0	10	0	0	0	0	0	0	0	0	10	<1%
Platform	6	5	4	545	20	0	4	0	0	1	2	0	587	22%
Tank Truck, Liquids or Gas	1	0	0	62	5	1	7	1	1	0	1	1	80	3%
Tank Truck Dry Bulk	0	0	0	16	2	1	0	4	0	0	0	0	23	1%
Dump Truck	1	0	0	3	0	0	0	0	0	0	0	0	4	<1%
Grain Bodies (hopper)	2	1	0	459	12	1	18	4	0	0	2	0	499	19%
Garbage Truck	0	0	0	1	0	0	0	0	0	0	0	0	1	<1%
Auto Transport	1	2	0	7	0	0	0	0	0	1	0	0	11	<1%
Livestock	3	0	0	155	7	0	1	0	0	0	1	0	167	6%
Unknown	3	0	0	21	1	0	0	0	1	2	92	0	120	4%
Other	1	0	0	1	0	0	3	0	0	0	3	3	11	<1%
Total	50	12	7	2375	51	4	33	16	30	4	101	4	2687	100%
Percentage	2%	<1%	<1%	88%	2%	<1%	1%	1%	1%	<1%	4%	<1%	100%	

Source: Emerson Scale Survey - February, June and August 1996

- The fleet is as follows: 2-, 3-, and 4-axle straight trucks combined account for 1.9 percent; 3-S2s account for 88.4 percent; 3-S3s account for 1.9 percent; 7- and 8-axle B-trains combined account for 1.4 percent; other configurations account for 6.4 percent.

- Vans account for 43.4 percent of the fleet (almost 30 percent of those vans are equipped with refrigerating units); flat beds account for 21.9 percent of the trucks surveyed; grain bodies account for 18.6 percent; livestock trucks account for 6.3 percent; other body types account for 9.8 percent of the trucks surveyed. Table 3-5 shows the truck fleet distribution by configuration and body type for all trucks classified.

Of the 1,167 loaded trucks traveling northbound:

- The fleet mix is as follows: 2-, 3-, and 4-axle straight trucks combined account for 1.4 percent; 3-S2s account for 89.5 percent; 3-S3s account for 1.7 percent; 7- and 8-axle B-trains combined account for 0.9 percent; other configurations account for 6.5 percent.

- Vans account for 52.8 percent of the fleet (almost 30 percent of those vans are equipped with refrigerating units); flat beds account for 20.4 percent of the trucks surveyed; grain bodies account for 17.6 percent; livestock trucks account for 1.0 percent; other body types account for 5.4 percent of the trucks surveyed.

Of the 1,292 loaded trucks traveling southbound:

- The fleet mix is as follows: 2-, 3-, and 4-axle straight trucks combined account for 2.4 percent; 3-S2s account for 87.9 percent; 3-S3s account for 2.1 percent; 7- and 8-axle B-trains combined account for 1.6 percent; other configurations account for 6.0 percent.

- Vans account for 35.0 percent of the fleet (almost 30 percent of those vans are equipped with refrigerating units); flat beds account for 23.5 percent of the trucks surveyed; grain bodies account for 19.0 percent; livestock trucks account for 11.2 percent; other body types account for 1.3 percent of the trucks surveyed.

In terms of weight distribution, the following was found regarding GVW of loaded trucks traveling northbound. This applies to the three major truck types (not including straight trucks):

- for 3-S2s--ranges from a low of 15,500 kg (34,100 pounds) to a high of 47,100 kg (103,837 pounds)--average GVW is 30,650 kg (67,570 pounds). Thirteen percent operate at a GVW greater than 80,000 pounds.

- for 3-S3s-- ranges from a low of 28,800 kg (63,490 pounds) to a high of 45,500 kg (100,310 pounds)--average GVW is 37,435 kg (82,530 pounds). Ten percent operate at a GVW greater than 90,000 pounds.

- for 8-axle B-trains (super B's)-- ranges from a low of 28,900 kg (63,712 pounds) to a high of 48,300 kg (106,482 pounds) --average GVW is 41,830 kg (92,225 pounds). One of nine trucks going through the scale operates at a GVW greater than 105,000 pounds.

For the three major configurations (not including straight trucks) of loaded trucks traveling southbound, GVWs are as follows:

- for 3-S2s-- ranges from a low of 15,400 kg (23,880 pounds) to a high of 43,300 kg (95,460 pounds) --average GVW is 32,600 kg (71,870 pounds). Nearly 20 percent operate at more than 80,000 pounds GVW.

- for 3-S3s-- ranges from a low of 28,700 kg (63,272 pounds) to a high of 41,600 kg (91,712 pounds)--the average GVW being 37,500 kg (82,706 pounds). Eight percent operate at more than 90,000 pounds GVW.

- for 8-axle B-trains (super Bs)-- ranges from a low of 31,000 kg (68,343 pounds) to a high of 48,700 kg (107,365 pounds) --average GVW is 45,475 kg (100,251 pounds). Four of nineteen trucks going through the scale operates at more than 105,000 pounds GVW.

3.4.2 Fleet Characteristics Based on Manitoba-based Truck Load Carrier Survey

A carrier survey was conducted in Winnipeg, Manitoba in October, 1996. The issues discussed are shown in Appendix E. The survey was directed at truck load carriers. Nine of the major Manitoba-based carriers were interviewed to obtain information regarding origin-destinations, commodities hauled, equipment used, method of operation, intermodal operations, activity levels, and other information regarding trucking between Manitoba and the U.S. The carriers surveyed were:

- Arnold Brothers Transport Ltd.
- Kleysen Transport
- Trapper's Transport
- Transx
- Bison Transport
- Penner International Inc.
- Big Freight Systems Inc.
- Erb Enterprises Ltd.
- Gershman Transport International

From the interviews, the following was found:

Fleet, Equipment and TS&W Issues

In terms of the fleet size, the nine carriers operate a combined fleet of about 2,160 tractors and 4,425 trailers, for an average trailer-to-tractor ratio of about 2. Approximately 80 percent of the trailers are vans. More than one-quarter of these are equipped with refrigerating units. Flat beds account for about 10 percent of the trailers. Other body types (e.g. hopper bottom, dry bulk and liquid tanks) account for the remaining 10 percent of the trailer fleet. More than one-half of the trailers are 53 feet in length, about 45 percent are 48 feet and the remaining are other lengths, less than 48 feet. All new semitrailers in the past year have been 53-footers for most of the companies. The standard trailer width is 102 inches and the standard van height is 13.5 feet. Most of the fleet consists of tandem-axle semitrailers.

During the past few years, all of the surveyed carriers have shifted to lighter equipment. The main reasons for this are: (1) certain high density commodities (paper, for example) have forced some companies to run this equipment (these are companies that have a high weigh-out component in their operations); (2) to be able to compete with other Canadian carriers--not with U.S. carriers; and (3) operating costs decrease with the use of this new equipment. With this lighter equipment, typical payloads range from 43,000 pounds to about 48,000 pounds. At 80,000 pounds GVW, this allows a tare weight of about 32,000 to 37,000 pounds. All carriers surveyed are running average tare weights of approximately 33,500 pounds for the unit (fully equipped tractors are fairly heavy).

Only three of the surveyed carriers operate tridem-axle semitrailers into the U.S. Typical payloads with this type of trailers range from 44,000 pounds to 57,000 pounds. One of these carriers indicated that with the use of tridems, there is more flexibility on axle requirements in terms of weight. The other six carriers either do not operate tridems at all or only operate them within Canada because: (1) they are not allowed in certain States; (2) "most of the U.S. is restricted to 80,000 pounds"; (3) "the extra axle decreases the miles per gallon by about 10 to 12 percent"; or (4) "the wear and tear in the middle axle is excessive".

Three of the carriers operate B-trains, mainly across Canada (some B-trains are taken into North Dakota). Another carrier operates rocky mountain doubles from Winnipeg to Alberta. None of the carriers has considered the possibility to start operating triple trailer combinations. The main reason is that in their opinion, triples are good for LTL movements, not for TL. In nearly all the cases, the LTL component of their operations accounts for 10 to 15 percent of the total.

In terms of gross vehicle weight, all companies operate most of the time at 80,000 pounds or less everywhere in the U.S. The 10 percent winter weight allowance in Minnesota is of no consequence to most carriers because most of the operations (1) are not destined for Minnesota; (2) are destined for States that have a maximum allowable GVW of 80,000 pounds; or (3) need to go through States that have a maximum allowable GVW of 80,000 pounds. There is one carrier that makes use of this 10 percent weight allowance but only in its intermodal operation. In this operation, between 10 and 15 tractors with vans are used to haul agricultural products from Minnesota and North Dakota to Winnipeg. The vans are then shipped by rail from Winnipeg to eastern Canada, for final delivery, by truck, in the eastern U.S. In winter, the company operates at GVWs of about 85,000 pounds only in the intermodal operation.

In terms of split tandems (defined in Section 3.7), most carriers do not use them, and think that at the moment this type of axle configuration is not critical to their operations. One of the carriers makes use of split tandems in its Ontario operations. Another carrier makes use of split tandems in its operations within the U.S. Five of the nine carriers think that if this type of axle arrangement were allowed in Manitoba, it could increase the company's opportunities in the movement of freight. They also think that split tandems are useful because: (1) there is more flexibility of loading (specially for the weight-out carriers); and (2) the payload can increase. The other four carriers would not make use of split tandems in their operations mainly because the fleet would become "equipment specific", therefore restricting its operations and access area.

Lift axles are not used and would not be used by any of the carriers surveyed. The reasons for this are: (1) lift axles add tare weight to the trucks; (2) there are too many operating restrictions with lift axles; (3) with the use of lift axles, the fleet would become "specialized" or "equipment-specific", therefore restricting the company's access area; and (4) there is a higher maintenance cost associated with the use of these axles.

Most of the carriers were not familiar with wide-base tires. However, all of them think that these tires are not beneficial to their companies because wide-base tires are more useful in localized movement. One of the carriers mentioned that by using wide-base tires, trucks would always be forced to carry spare tires, which would add to the tare weight of the vehicle. Thus, "the benefit of a super single in terms of weight is taken away by the need to carry the extra tire."

Intermodal Operations

Four of the carriers are not involved in any intermodal operations. Rail is only used by these carriers to reposition their equipment. The other five carriers have a combined domestic container fleet of approximately 1,210 containers. These containers are mainly 48 and 53 feet in length. The typical payload on the 53-foot containers used by one of these carriers is about 54,000 pounds. At 80,000 pounds GVW, this allows a tare weight of only about 26,000 pounds.

One of the carriers has a small intermodal operation with Canadian National Railway (CN). This operation consists of the following: (1) a tractor takes an empty international container from the CN Intermodal terminal to southern Manitoba to pick up seeds; (2) the container is taken back to the CN Intermodal terminal in Winnipeg for rail movement to Montreal; (3) the container is then shipped overseas from Montreal.

In terms of competitive issues, according to the surveyed carriers, rail is only competitive in: (1) east-west operations; (2) long-haul movements (this is because of rail rates--for example, for a truck load to be moved from western Canada to eastern Canada, rail charges about $650. For the same shipment, a trucking company charges between $1,200 and $1,400); and (3) non time-sensitive operations. Rail is not competitive regarding service.

3.4.3 I-29 and I-35 On-Road Surveys

Truck classification surveys were conducted along the full length of the I-29 and I-35 and on selected sections of major inter-connecting routes during three field trips (April 28 to May 2, 1996; May 27 to June 1, 1996; and August 26 to August 30, 1996). These surveys provide insights into on-road vehicle characteristics that cannot be obtained from standard classification monitoring. In particular: (1) configurations are more specifically defined; (2) configurations are related to body type; (3) trailer lengths are established; (4) the incidence of split tandems is established; and (5) the role of lift axles is established. The analysis presented in this section is divided into four components: (1) the PTH 75 component of the field survey, from Winnipeg to the Manitoba-North Dakota Border; (2) the I-29 component of the field survey; (3) the I-35 component of the field survey; and (4) the connecting routes component of the survey.

Provincial Trunk Highway 75

Table G-1-a in Appendix G shows the fleet distribution by body type of trucks operating on PTH 75 between Winnipeg and the U.S.-Manitoba border. A total of 97 trucks were classified on this link and the following was found:

- Straight trucks with 2 or 3 axles accounted for 9 percent of the trucks classified.
- Of the 97 trucks classified, 89.0 percent had five or more axles. Of the 86 trucks with five or more axles, 78.0 percent were 3-S2s; 1.1 percent were STAA doubles; 14.0 percent were tridem-axle semitrailers; 7.0 percent were super B-trains; and 1.1 percent were truck + trailers with 5 axles.
- Vans accounted for 35.0 percent of the classified trucks; grain bodies accounted for 18.0 percent; platforms accounted for 23.7 percent; gravel bodies accounted for 8.2 percent; livestock trucks accounted for 2.0 percent; liquid tankers accounted for 3.1 percent; and other bodies accounted for 10.3 percent.
- More than three-quarters of the vans operating on PTH 75 were on 5-axle tractor semitrailers;. 15.6 percent were on 2/3-axle straight trucks; and 3.1 percent were on STAA doubles.
- More than one-third of grain bodies were on B-trains; 52.9 percent were on 3-S2s; and about 5.9 percent were on 2/3-axle straight trucks and on tridem axle semitrailer.

I-29 Survey

Tables G-1-b to G-1-d in Appendix G show summary statistics of the classification and body types of 1,282 trucks observed operating on the I-29 during the survey period, by State. In total:

- Straight trucks (principally with 2 and 3 axles, and some with 4 or 5 axles) accounted for 10.4 percent of the trucks classified during the survey. They were most prevalent in South Dakota (11.5 percent of the observed fleet in that State) and least prevalent in Iowa (7.5 percent of the observed fleet).

- Of the 1,121 surveyed trucks with five or more axles: 89.7 percent were 3-S2s; 2.2 percent were STAA doubles (mainly 2-S1-2s); 3.8 percent were tridem-axle semitrailers; 0.4 percent were 3-S4s; another 0.4 percent were triples; 0.3 percent were B-trains; other configurations accounted for 3.2 percent.

- Of the 1,015 surveyed 3-S2s: six percent had a split tandem axle; 8.6 of 10 split tandems were on platforms.

- Vans accounted for almost one-half (49.2 percent) of the classified trucks; platforms accounted for 13.0 percent; hopper bottom bodies accounted for 19.0 percent; liquid tankers accounted for 5.7 percent; livestock trucks accounted for 4.5 percent; and other body types accounted for 8.6 percent.

- Of 631 vans, almost one-quarter were equipped with reefers. The State where most of the insulated refrigerated vans were observed was Iowa (28.0 percent of the vans in the State). In North Dakota, insulated refrigerated vans accounted for 18.0 percent; and in South Dakota they accounted for 22.2 percent.

- Of 1,282 trucks classified in North Dakota, South Dakota and Iowa, 2.0 percent (25 trucks) were equipped with lift axles. The State where most of the lift axles were observed was South Dakota (48 percent of the total observations in the three States). Lift axles are almost as common in North Dakota (10 of 25 observations). Only 3 trucks equipped with lift axles were observed in Iowa.

I-35 Survey [Ref. 1]

Tables G-2 and G-3 and Figures G-1 and G-2 in Appendix G, show summary statistics of the classification and body types of 8,050 trucks observed operating on the I-35 during the survey periods, by State. In total:

- Straight trucks accounted for 7.3 percent of the trucks classified during these survey periods. They were most prevalent in Minnesota (10.5 percent of the observed fleet) and least prevalent in Oklahoma (4.4 percent of the observed fleet). No 4/5-axle straight trucks were observed in Kansas, Oklahoma or Texas.

- Of the 7,173 surveyed trucks with five or more axles: 95.6 percent were 3-S2s; 3.0 percent were STAA doubles (mainly 2-S1-2s); 0.9 percent were tridem axle semitrailers; and 0.2 percent were truck + trailers with 5/6-axles.

- Of the 6,859 surveyed 3-S2s: 1 of 19 had a split tandem axle; nine of 10 split tandems were on platforms (Tables G-4-a through G-4-f); about one-third of platforms had split tandems.

- Vans accounted for two-thirds (65.8 percent) of the classified trucks; platforms accounted for 14.0 percent; weight-out specialized body types (grain, gravel, dump, JM boxes) accounted for 7.4 percent; liquid and dry bulk tankers accounted for 6.1 percent; containers (principally domestic) on flatbeds accounted for 1.8 percent.

- Of 4,431 3-S2 tractor-semitrailer combinations with vans about one-quarter (22.7 percent) had semitrailers which were 53 feet or longer. The percentage of semitrailers longer than 53 feet was smaller (about 1 of 10) in the two northern corridor States (Minnesota and Iowa), and larger (ranging from 1 of 5 in Missouri to about one-third in Oklahoma) in the four southern corridor States.

- Of 5,299 vans, almost 20 percent were equipped with reefers. The State where most of the insulated refrigerated vans were observed was Texas (almost 1 in 11). In Minnesota, insulated refrigerated vans accounted for less than one percent of the total vans in the I-35 corridor. In Iowa, reefers accounted for 2.9 percent; in Kansas they accounted for 2.2 percent; and in Oklahoma reefers accounted for 3.1 percent.

- Of 2,456 trucks classified in Minnesota, Iowa and Missouri, 2.0 percent (49 trucks) were equipped with lift axles. The State where most of the lift axles were observed was Minnesota (73 percent of the total observations in the three States). Lift axles are less common in Iowa and Missouri than in Minnesota. Of the 49 observations, 8 were made in Iowa and only 5 in Missouri. No lift axles were observed in Kansas, Oklahoma or Texas.

- Single tires (narrow and wide-base) were observed in all corridor States in selected circumstances. Low profile tires were common in lift axles and in high cube equipment.

- Based on telephone conversations with employees of a trailer manufacturing company in Minnesota, the main reason for having lift axles in Minnesota is to increase the payload and at the same time comply with the Bridge Formula. The position of the lift axle is determined by the type and use of truck (for example, a dump truck may need a tag axle to support the weight when unloading). Another important observation regarding lift axles are the low profile tires. According to the company, low profile tires are used for ground clearance. These tires, however, can only carry between 5,000 to 7,000 pounds per axle.

Survey on Routes Connecting to I-35

Tables G-5 and G-6 in Appendix G show summary statistics of the classification and body types of 2,632 trucks observed operating on interstates connecting with the I-35 during the survey periods, by State. In total:

- Straight trucks (principally with 2/3-axles, and some with 4 or 5-axles) accounted for 8.1 percent of the trucks classified during this research.
- Of the 2,363 surveyed trucks with five or more axles: (1) 94.1 percent were 3-S2s; (2) 3.9 percent were STAA doubles (mainly 2-S1-2s); (3) 1.4 percent were tridem axle semitrailers; and (4) 0.6 percent were truck + trailers with 5/6-axles.
- Of the 2,222 surveyed 3-S2s, 1 of 14 had a split tandem axle.
- Vans accounted for three-quarters of the classified trucks; platforms accounted for 14.9 percent; weight-out specialized body types (grain, gravel, dump, JM boxes) accounted for 8.1 percent; liquid and dry bulk tankers accounted for 6.5 percent; containers (principally domestic) on flatbeds accounted for less than one percent.
- Of 1,703 3-S2 tractor-semitrailer combinations with vans, more than one-quarter (28.8 percent) had semitrailers which were 53 feet or longer. The percentage of 53+ semitrailers was smaller (about 1 of 6) in Minnesota, and larger (ranging from 1 of 5 in Iowa to about 1 of 2 in Missouri) in the remaining five corridor States.

3.4.4 Mexican Transportation Institute Survey [Ref. 3, p 41-44]

A Comprehensive Truck Size and Weight Study was started in Mexico in 1991 by the Secretaría de Comunicaciones y Transportes (SCT). The study consists of three phases: (1) collection and analysis of size and weight data for vehicles that operate on national trunk highways; (2) analysis of the effect that weights and dimensions of vehicles have on the pavement, bridges, traffic operating patterns and on the economy; and (3) generation of alternatives to reduce problems arising from present TS&W regulations. The findings are presented in a series of reports entitled "Estudio de Pesos y Dimensiones de los Vehículos que Circulan Sobre las Carreteras Mexicanas" ("Study of the Size and Weight of Vehicles that Operate on Mexican Roads"). Technical reports on the different phases of the study were published by the Mexican Transportation Institute between 1992 and 1996.

As part of Phase 1, the Dirección General de Proyectos, Servicios Técnicos y Concesiones conducted surveys in 1991 (sample size--117,361 trucks at 10 stations); 1992 (sample size--34,176 trucks at 3 stations); 1993 (sample size--276,318 trucks at 46 stations); and 1994 (sample size--110,367 trucks at 18 stations), to evaluate the degree of compliance with Mexican TS&W regulations by carriers operating within Mexico. The truck weights for all surveys were obtained using weigh-in-motion (WIM) scales. The survey conducted in 1994 focused more on crossborder trucking operations than did the previous surveys. For that reason, this survey is of particular importance to U.S. TS&W considerations and understanding of crossborder trucking. The study reports on a series of road-side surveys conducted close to the U.S.-Mexico border on most major Mexican highways connecting with the U.S. Tables 3-6 and 3-7 show fleet mix, percent empty and percent overweight trucking for each connecting highway.

The following observations can be made about the total fleet mix on Mexican highways close to the U.S.-Mexico border in the corridor:

- There is a large preponderance of 2- and 3-axle straight trucks. These configurations account for about 30 percent of the fleet on the toll road and 22 percent of the fleet on the non-toll road south of Laredo.

- 3-S2s typically account for about one-quarter to one-half of the fleet, except south of Laredo on the non-toll road, where they account for three-quarters.

- 3-S3s are common on most of the northern roads in Mexico, accounting for about one-third of the fleet south of Hidalgo, Brownsville and Eagle Pass, and for about one-tenth of the fleet south of El Paso, Texas.

Table 3-6

1994 Fleet Mix on Mexican Highways Close to the U.S.-Mexico Border

(All Trucks)

FEDERAL HIGHWAY	SEGMENT	TOTAL TRUCKS SURVEYED (percent empty)	FLEET MIX OF TOTAL TRUCKS SURVEYED [%] (percent empty)				
			2-axle	3-axle	3-S2	3-S3	Other
45	El Sueco - Ciudad Juárez (S of El Paso, TX)	4,688 (38.0)	22.9 (52.8)	12.0 (44.2)	44.9 (31.0)	9.9 (36.5)	10.3
57	Monclova - Piedras Negras (S of Eagle Pass, TX)	4,513 (51.0)	21.8 (64.3)	22.6 (52.0)	23.6 (40.3)	27.3 (49.7)	4.7
85 (non-toll road)	Monterrey - Nuevo Laredo (S of Laredo, TX)	13,724 (32.0)	13.6 (49.8)	7.1 (51.8)	74.4 (26.7)	2.4 (33.4)	2.5
85 (toll road)	Monterrey - Nuevo Laredo (S of Laredo, TX)	686 (23.0)	24.8 (43.5)	4.5 (35.5)	58.3 (13.0)	7.1 (11.4)	5.3
2	Matamoros - Reynosa (SE of Hidalgo, TX)	4,355 (46.0)	23.8 (50.9)	11.7 (54.0)	24.6 (44.2)	35.3 (39.2)	4.6
180	Ciudad Victoria - Matamoros (S of Brownsville, TX)	5,189 (43.0)	24.1 (45.6)	15.5 (57.7)	22.2 (56.1)	34.6 (41.2)	3.6

Source: "Estudio de Pesos y Dimensiones de los Vehículos que Circulan Sobre las Carreteras nacionales: Análisis Estadístico de la Información Recopilada en las Estaciones Instaladas en 1994", 1996

- Many trucks are empty, ranging from a low of 11 percent south of Laredo, on the toll road, to more than one-half, south of Brownsville, Texas. About one-half of straight trucks and one-third of 3-S2s and 3-S3s are empty.

The following observations can be made about loaded, crossborder trucks operating on the northern roads of Mexico (Table 3-7):

- Two- and three-axle straight trucks are commonly used in crossborder movements (between 10 and 25 percent at most of the crossings).

- 3-S2s are the most common trucks at all of the crossings, ranging from about one-half to 85 percent, except for the crossings of Hidalgo and Brownsville in southern Texas.

Table 3-7

1994 Fleet Mix on Mexican Highways Close to the U.S.-Mexico Border

(Loaded Trucks Only)

FEDERAL HIGHWAY	SEGMENT	TOTAL TRUCKS SURVEYED (percent overweight on Mexico GVW)	FLEET MIX OF TOTAL TRUCKS SURVEYED [%]				
			2-axle	3-axle	3-S2	3-S3	Other
NORTHBOUND (Exports from Mexico to the U.S.)							
45	El Sueco - Ciudad Juárez (S of El Paso, TX)	319 (4.7)	8.2	6.9	68.7	6.0	10.4
57	Monclova - Piedras Negras (S of Eagle Pass, TX)	45 (24.4)	4.4	8.9	55.6	20.0	11.1
85 (non-toll road)	Monterrey - Nuevo Laredo (S of Laredo, TX)	1,791 (12.5)	5.6	4.0	85.0	3.4	1.9
85 (toll road)	Monterrey - Nuevo Laredo (S of Laredo, TX)	58 (15.5)	6.9	0.0	77.6	12.1	3.4
2	Matamoros - Reynosa (SE of Hidalgo, TX)	226 (46.9)	8.0	5.3	37.6	46.5	2.7
180	Ciudad Victoria - Matamoros (S of Brownsville, TX)	374 (35.8)	10.4	15.8	34.0	35.8	4.0
SOUTHBOUND (Imports from the U.S. into Mexico)							
45	El Sueco - Ciudad Juárez (S of El Paso, TX)	549 (6.9)	12.9	6.2	59.2	8.6	13.1
57	Monclova - Piedras Negras (S of Eagle Pass, TX)	78 (29.5)	11.5	11.5	50.0	19.2	7.7
85 (non-toll road)	Monterrey - Nuevo Laredo (S of Laredo, TX)	3,320 (3.4)	7.7	3.8	85.2	1.0	2.3
85 (toll road)	Monterrey - Nuevo Laredo (S of Laredo, TX)	121 (3.3)	12.4	2.5	79.3	4.1	1.7
2	Matamoros - Reynosa (SE of Hidalgo, TX)	417 (47.2)	14.1	8.2	27.8	45.1	4.8
180	Ciudad Victoria - Matamoros (S of Brownsville, TX)	831 (36.8)	16.0	17.8	36.2	36.1	3.9

Source: "Estudio de Pesos y Dimensiones de los Vehículos que Circulan Sobre las Carreteras Nacionales: Análisis Estadístico de la Información Recopilada en las Estaciones Instaladas en 1994", 1996

- 3-S3s account from a low of about 10 percent to nearly one-half of the fleet mix at all crossings.
- Based on weigh-in-motion measurements of GVW, substantial numbers of the trucks crossing at Brownsville, Hidalgo, Eagle Pass and Laredo (particularly northbound) were determined to be overweight relative to Mexican GVW limits. This observation must be qualified by noting that weigh-in-motion measurements overstate the incidence of overweight trucking relative to static weight limits.

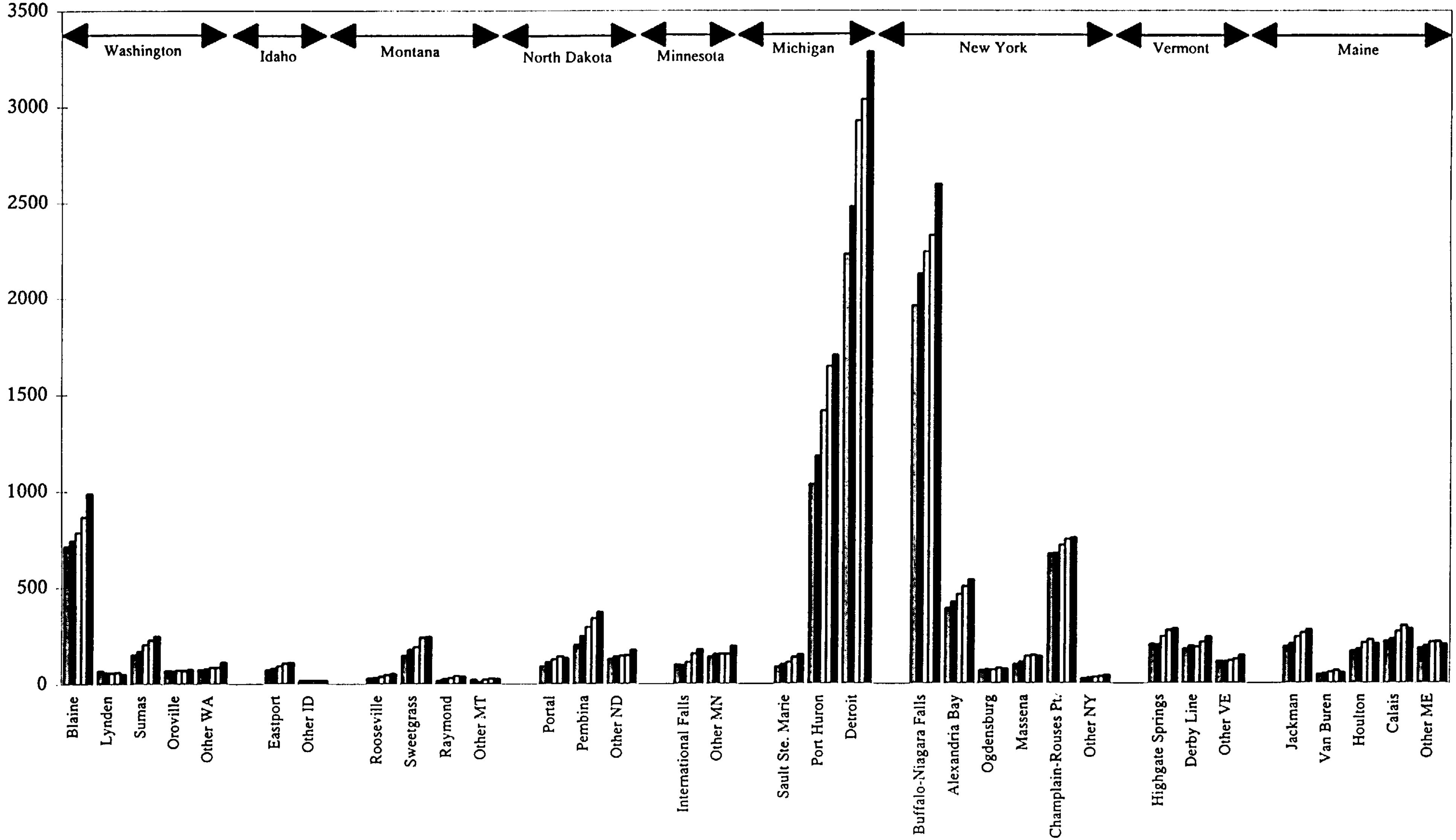
3.5 Canada-U.S. Border in the Corridor

There are 85 highway crossings on the Canada-U.S. border. Almost two-thirds (54 crossings) are located in western Canada and the remaining one-third (31 crossings) are located in eastern Canada. Figure 3-4 shows trucking activity between 1991 and 1995 at most of the crossings. In 1995 southbound truck crossings on the entire U.S.-Canada border averaged 14,008 trucks per day. Between 1991 and 1995, southbound movements increased at a rate of 9.2 percent per year along this border. In the corridor States of North Dakota and Minnesota, southbound truck crossings averaged 1,058 trucks per day in 1995. The growth rate between 1991 and 1995 was 12.3 percent per year.

There are 17 highway crossings on the Manitoba-U.S. border. There are 12 crossings on the Manitoba-North Dakota border and 5 crossings on the Manitoba-Minnesota border. These crossings are listed in Table 3-8 and shown in Figure 3-5. Truck volumes across the Manitoba-U.S. border by port of entry were obtained from U.S. Customs for southbound movements and from Statistics Canada for northbound movements. Table H-1 in Appendix H shows the 1995 northbound and southbound daily trucking movements across each of the ports of entry of this border.

Total southbound crossings of the Manitoba-U.S. border averaged 1,058 trucks per day in 1995. This represents about 20 percent of all truck crossings of the western U.S.-Canada border and about 4 percent of all truck crossings of the Canada-U.S. border. Also in 1995,

Figure 3-4
U.S.-Bound Trucks/Day on the U.S.-Canada Border (1991-1995)



Source: U.S. Customs

Compiled and Prepared by J. Montufar 30/11/96

Table 3-8
Crossings in the Manitoba-U.S. Border

State-Province	United States		Manitoba	
	Highway	GVW Limit (pounds)	Highways	GVW Limit kilograms(pounds)
NORTH DAKOTA-MANITOBA				
Antler-Lyleton	256	105,500	256 B1	47,600 (104,938)*
West Hope-Coulter	83 NN, NHS	105,500	83 A1	56,500 (124,560)
Carbury-Goodlands	14	105,500	21 A1	56,500 (124,560)
Dunseith-Peace Garden	281 NN, NHS	105,500	10 MoU	62,500 (137,788)
St. John-Lena-Killarney	30	105,500	18 A1	56,500 (124,560)
Hansboro-Cartwright	69	105,500	5 A1	56,500 (124,560)
Sarles-Crystal City	20	105,500	34 A1	56,500 (124,560)
Hannah-Snowflake		105,500	242 B1	47,600 (104,938)
Maida-Windygates	1	105,500	31 A1	56,500 (124,560)
Walhalla-Winkler	32	105,500	32 A1	56,500 (124,560)
Neche-Gretna	18	105,500	30 A1	56,500 (124,560)
Pembina-Emerson	I-29 NN, NHS	105,500	29 MoU, CNHS	62,500 (137,788)
MINNESOTA-MANITOBA				
Noyes-Emerson East	75 NN	80,000/88,000^	75 A1	56,500 (124,560)
Lancaster-Tolstoi	59	80,000/88,000^	59 A1	56,500 (124,560)
Pinecreek-Piney	89	80,000/88,000^	89 A1	56,500 (124,560)
Roseau-South Junction	310	80,000/88,000^	310 B1	47,600 (104,938)
Warroad-Sprague	313	80,000/88,000^	12 MoU	62,500 (137,788)

Source: Reference 7

Notes:

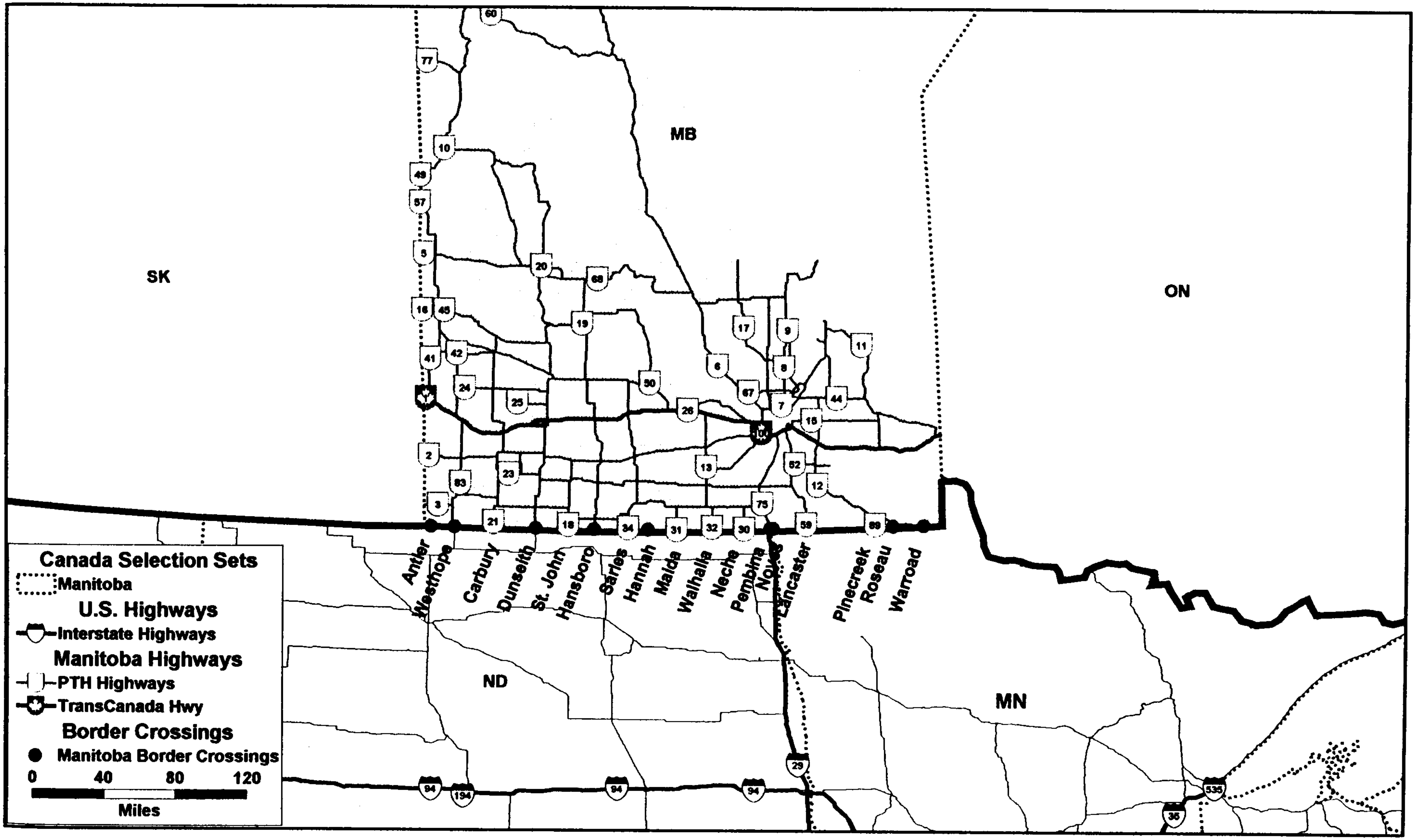
* Subject to spring restrictions

^ 88,000 pounds applies in the winter months

NN- National Network highways; NHS - National Highway System highways; CNHS - Canadian National Highway System highway; MoU - Canadian Memorandum of Understanding (RTAC); A1 - Manitoba A1 Class highway

Figure 3-5

Manitoba-U.S. Border Crossing



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the Pembina-Emerson crossing accounted for two-thirds of total truck traffic crossing the Manitoba-U.S. border. There was a 5 percent decrease in truck movements across the Manitoba-U.S. border between 1994 and 1995. A possible reason for this decrease could be an economic downturn. Figures 3-6-a and 3-6-b show truck flows across the eight major Manitoba-U.S. border crossings and the three major Texas-Mexico border crossings respectively.

The following section discusses the Pembina-Emerson crossing. Detailed discussions of the remaining 16 Manitoba-U.S. crossings are included in Appendix H.

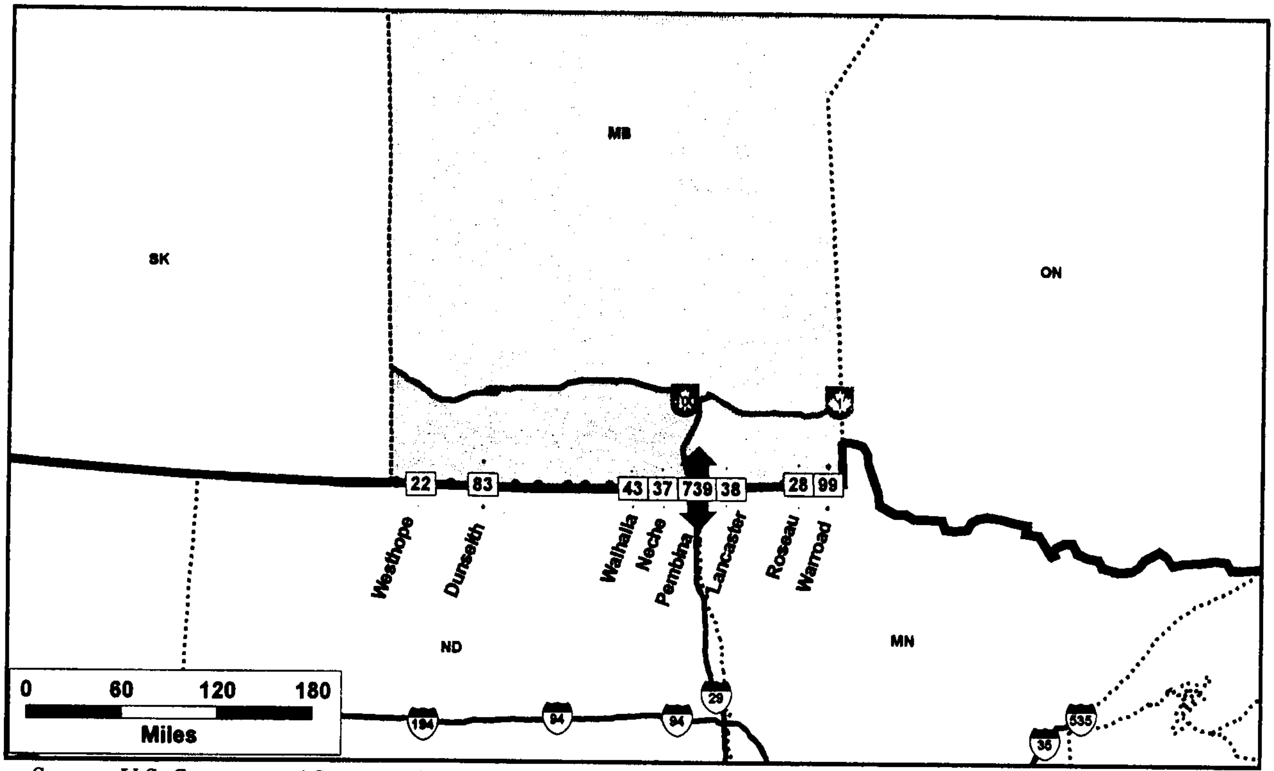
3.5.1 Pembina-Emerson

The Pembina-Emerson crossing is located on I-29 (on the U.S. side) and on PTH 75 (on the Canada side). This is the highest volume crossing on the Manitoba-U.S. border and second highest on the western border, averaging a two-way total of 739 trucks per day in 1995. This is 10 percent higher than in 1994 and almost 80 percent higher than in 1992. Between 1992 and 1994, southbound passenger car traffic decreased, while southbound truck traffic increased. A major reason for this growth was the devaluation of the Canadian dollar [Ref.7, p B-11].

Southbound traffic includes movements of livestock (mainly to Minnesota and South Dakota), machinery (mainly to North Dakota and the U.S. Mid-west), lumber (mainly to Minnesota), fresh produce (mainly to Minnesota and North Dakota), paper rolls (mainly to the northeast area of the U.S.), potash (mainly to Minnesota), building materials (mainly to Minnesota and North Dakota), and frozen french fries (to Mexico). [Ref. 6].

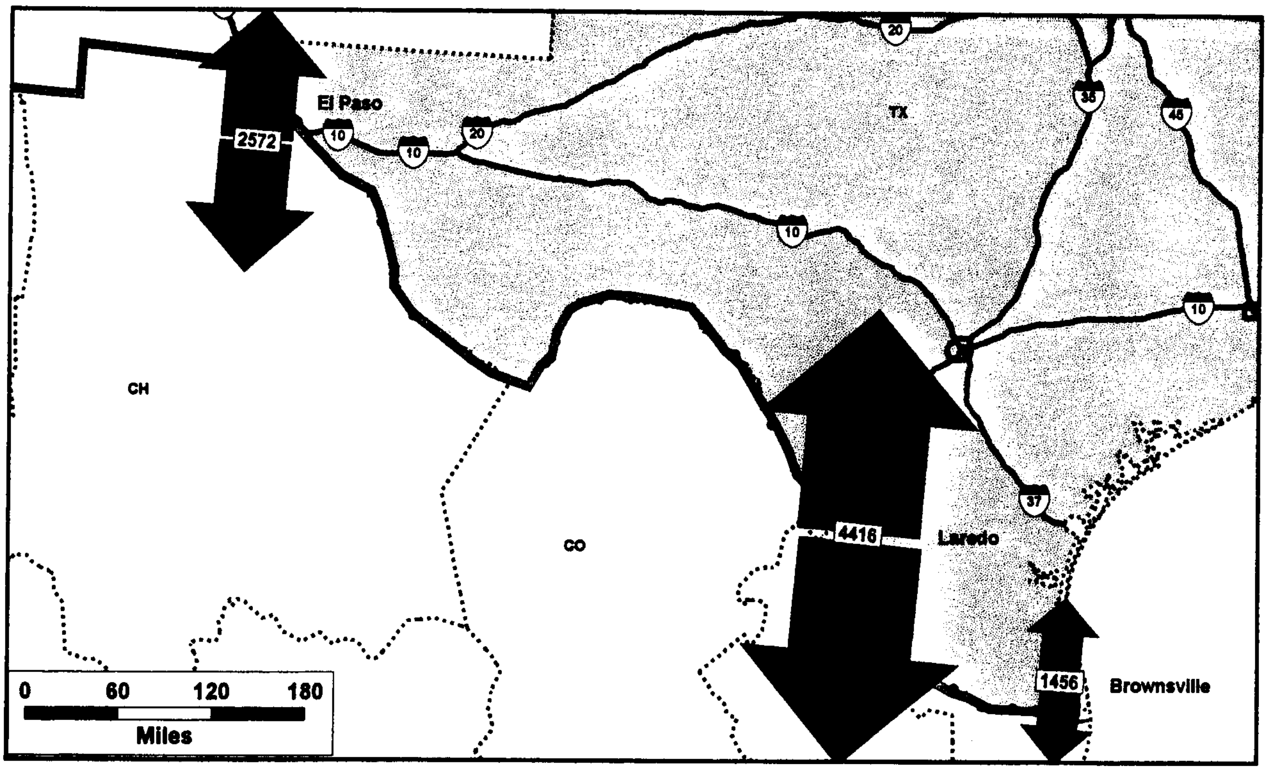
Being on I-29, this crossing is subject to the ISTEA freeze of 105,500 pounds GVW and 103-foot cargo-carrying unit length for a truck-tractor and two trailing units. [Ref. 7]. About 86 percent of the trucks using this crossing are tractor-semitrailers, primarily with five axles.

Figure 3-6-a
1995 Manitoba-U.S. Two-way Crossborder Trucking Movements [Trucks/Day]



Source: U.S. Customs and Statistics Canada

Figure 3-6-b
1995 Texas-Mexico Two-way Crossborder Trucking Movements [Trucks/Day]



Source: U.S. Customs and Mexico Customs

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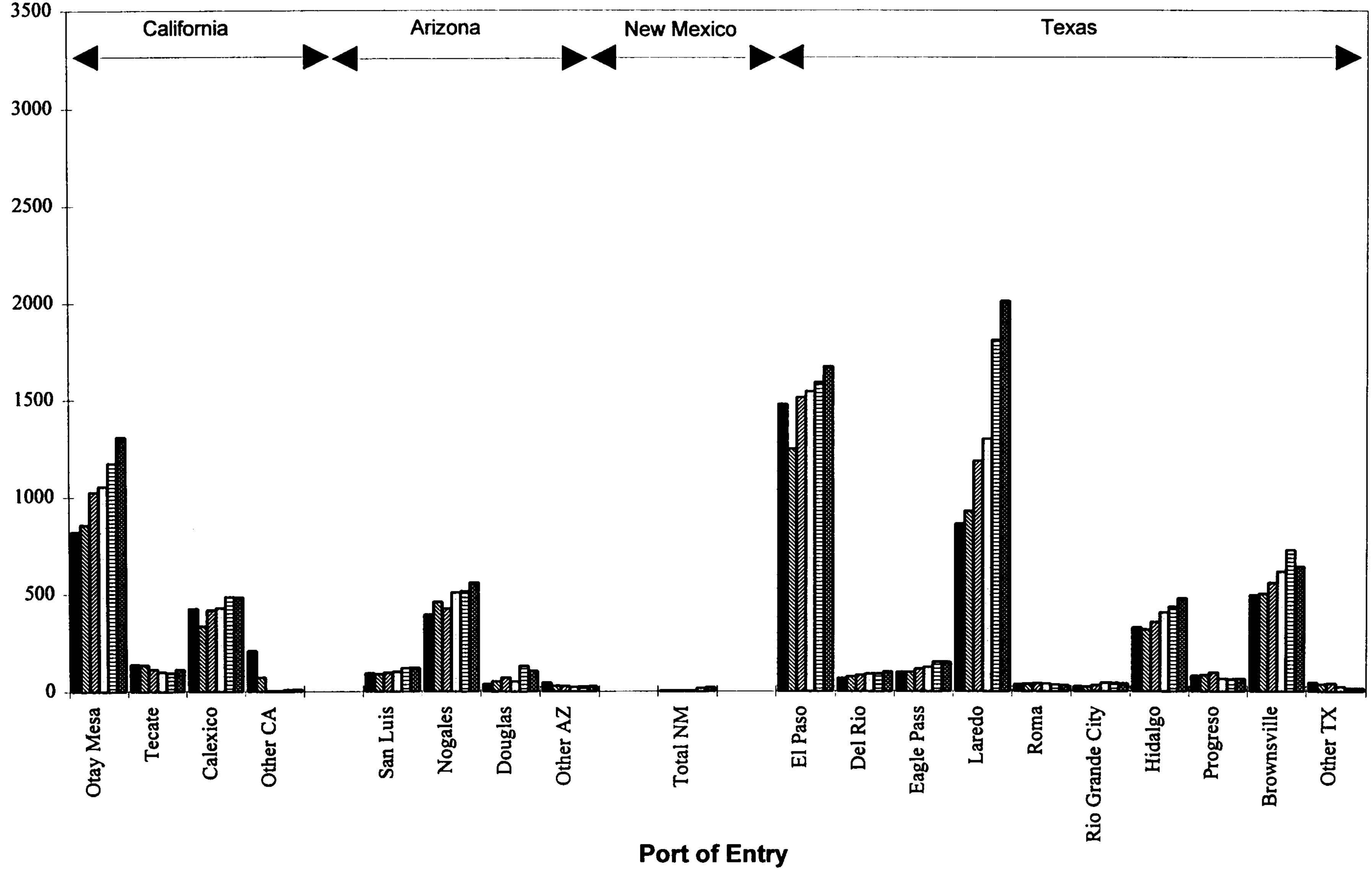
[Ref. 6]. These vehicles and their loadings are primarily controlled by Bridge Formula B and the U.S. Federal weight limits of 80,000 pounds GVW, 20,000 pounds on a single axle and 34,000 pounds on a tandem axle. This is because much of this traffic travels on I-94 east of Fargo, North Dakota into Minnesota and other eastern States that allow no more than 80,000 pounds GVW (e.g. Illinois).

It is expected that the new agreement between Manitoba and North Dakota about the one-direction weighing of commercial vehicles will have an effect on the GVWs that will operate in North Dakota and on the payload that will move from Manitoba to North Dakota. With this agreement, northbound trucks entering Manitoba are not weighed at the Joliette scale in North Dakota but at the Emerson scale. What this implies is that northbound trucks entering Manitoba could operate at GVWs greater than those specified by North Dakota.

3.6 U.S.-Mexico Border in the Corridor

There are 37 highway crossings on the U.S.-Mexico border. There are 5 crossings in California, 7 in Arizona, 3 in New Mexico, and 22 in Texas. Figure 3-7 shows the number of northbound trucks crossing into each State for fiscal years 1990 to 1995. In 1995, northbound truck crossings averaged 7,943 trucks per day (one-half of total southbound crossings at the U.S.-Canada border), an increase of 54 percent from 5,160 per day in 1991. Total northbound truck crossings into the four southern border States combined increased between 1991 and 1995 by 10.9 percent per year. Total northbound truck crossings into Texas increased by 9.0 percent per year between 1991 and 1995. Of the 22 highway crossings on the Texas-Mexico border, there are 7 on the Texas-Chihuahua border, 3 on the Texas-Coahuila border, 1 on the Texas-Nuevo Leon border, and 11 crossings on the Texas-Tamaulipas border. These crossings are listed in Table 3-9 and shown in Figure 3-8. Truck volumes across the Texas-Mexico border by port of entry were obtained from U.S. Customs for northbound movements and from Mexico Customs for southbound movements.

Figure 3-7
U.S.-bound Trucks/Day on the U.S.-Mexico Border (1990-1995)



Source: U.S. Customs

Compiled and prepared by J. Montufar

Table 3-9

Crossings in the Texas-Mexico Border

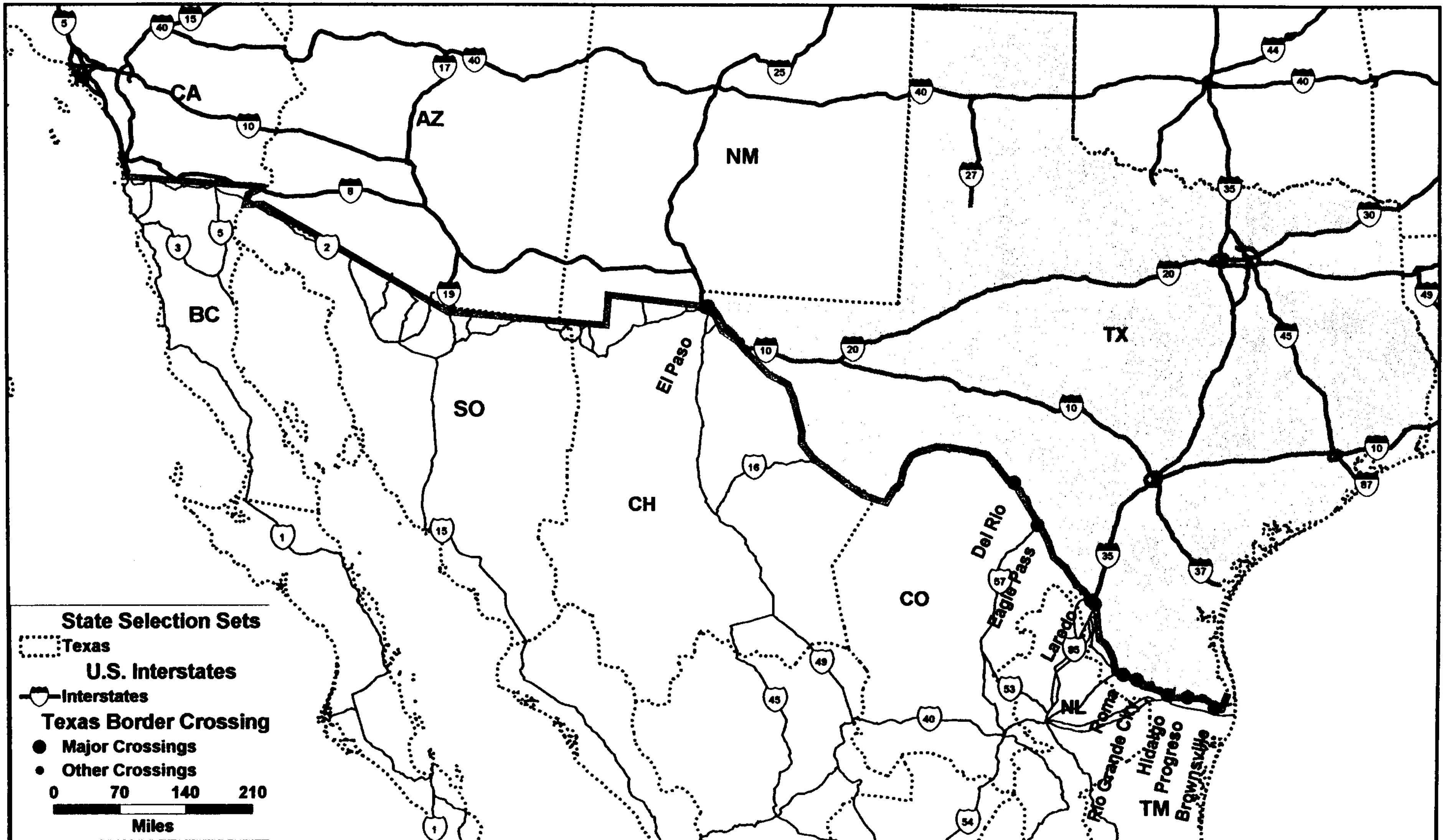
State	**Texas**		**Mexico**
	Highway	GVW Limit [pounds]	Highway
TEXAS-CHIHUAHUA			
Paso del Norte-Ciudad Juarez	62 NN, NHS	84,000	MX-45
Good Neighbor Bridge-Ciudad Juarez	62 NN, NHS	84,000	MX-2
Bridge of the Americas-Ciudad Juarez	I-10 NN, NHS	80,000	MX-2
Ysleta-Zaragoza	375 NN, NHS	84,000	MX-2
Fabens-Caseta	FM-1109	84,000	MX-2
Fort Hancock-El Porvenir	FM-1088	84,000	MX-2
Presidio-Ojinaga	67 NN	84,000	MX-16
TEXAS-COAHUILA			
Amistad Dam-Presa de la Amistad	90 NN, NHS	84,000	MX-2
Del Rio-Ciudad Acuna	277 NN, NHS	84,000	MX-2
Eagle Pass-Piedras Negras	57 NN, NHS	84,000	MX-57
TEXAS-NUEVO LEON			
Colombia-Colombia	FM-1472	84,000	MX-2
TEXAS-TAMAULIPAS			
Laredo/Convent Street-Nuevo Laredo	83 NN, NHS	84,000	MX-85
Laredo/Juarez-Nuevo Laredo	I-35	80,000	MX-85
Falcon Heights-Guerrero	83 NN, NHS	84,000	MX-2
Roma-Miguel Aleman	83 NN, NHS	84,000	MX-2
Rio Grande City-Ciudad Camargo	83 NN, NHS	84,000	MX-2
Los Ebanos-Gustavo Diaz Ordaz	83 NN, NHS	84,000	MX-2
Hidalgo-Ciudad Reynosa	115 NN	84,000	MX-2
Progreso-Nuevo Progreso	281 NN, NHS	84,000	MX-2
Los Indios-Solicento	281 NN, NHS	84,000	MX-2
Brownsville-Matamoros	77 NN, NHS	84,000	MX-180

Source: Reference 8

Notes: NN- National Network highways; NHS - National Highway System highways; MX -Mexican Federal Highway

Figure 3-8

Texas-Mexico Border Crossings



Source: NHPN GIS Database, 1995

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Source: NHPN GIS Database, 1995

Total crossings of the Texas-Mexico border averaged 10,447 trucks per day in both directions in 1995 (3,813,155 trucks for the year). This represents about one-half of all truck crossings of the entire U.S.-Mexico border. In that same year, 3 crossings accounted for more than 80 percent of total truck traffic crossing the Texas-Mexico border. These crossings are: (1) El Paso-Ciudad Juarez (includes Paso del Norte, Good Neighbor Bridge and Bridge of the Americas); (2) Laredo-Nuevo Laredo (includes Laredo/Convent Street and Laredo/ Juarez); and (3)Brownsville-Matamoros.

There was a 5 percent increase in truck movements across the Texas-Mexico border between 1994 and 1995.

The following section discusses the Laredo-Nuevo Laredo crossing in terms of activity and TS&W-related matters. The crossings of El Paso-Ciudad Juarez and Brownsville-Matamoros are discussed in Appendix H.

3.6.1 Laredo-Nuevo Laredo

This is the highest volume crossing on the U.S.-Mexico border, averaging a two-way truck traffic of 4,416 trucks per day in 1995. [Ref. 8]. Truck volumes at Laredo more than doubled from 1990 to 1995. Industrial activity in the vicinity of this crossing is low but due to its strategic location on the border, this crossing is used as the "hub" for most land transportation movements to and from the east-central area of Mexico and the United States. [Ref. 3, p 67]. Laredo-Nuevo Laredo is the closest crossing to Mexico City. It takes approximately 15 hours to travel from Nuevo Laredo to Mexico City (738 miles). [Ref. 9]. Southbound traffic is dominated by truckload movements of machinery, plastics, wood, paper and cardboard, chemical and organic products, processed food and automobiles. Northbound movements are dominated by glass products, beverages, coffee, paper products, minerals and construction material. [Ref. 10, p 18-21].

The truck fleet operating at this crossing is dominated by five-axle tractor semi-trailers, of which approximately 75 percent are vans. [Ref. 3, p 67]. Approximately 45 percent of the trucks that move through Laredo are empty. [Ref. 11, p 52]. This is because drayage companies typically pull full loads on half of their round trips. At this crossing, drayage companies play an important role since most of the traffic that goes through Laredo is not destined for maquiladoras but for areas outside the commercial zone.

Figure 3-6-b shows truck flows across the three major Texas-Mexico border crossings respectively. One important point to note from this figure when comparing it to Figure 3-6-a is that in 1995, the two crossings located at the start and end of the corridor--Pembina-Emerson on I-29 and Laredo-Nuevo Laredo on I-35--were high in volume with respect to other crossings on their corresponding border. However, there was nearly six times as much truck traffic crossing at the Laredo-Nuevo Laredo port of entry, as at the Pembina-Emerson port of entry.

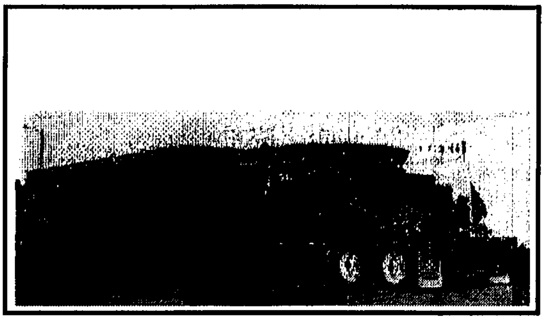
3.7 Truck Characteristics and Operations

The photographs on the following pages illustrate the range of truck types operating in the Mid-continent corridor States.

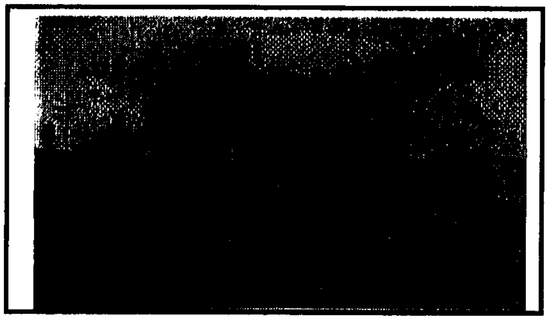
Standard 3-S2s

As is the case throughout North America, standard 3-S2s with a wide range of body types, tractor wheelbases, inter-axle spacings, and axle spreads, are by far the most common vehicle in the large truck fleet operating in the corridor. Of the 1,121 trucks surveyed on the I-29 having five axles or more, 9 of 10 were 3-S2s. About 7 percent of these 3-S2s had split tandem axles. Of the 3,922 trucks surveyed at the Emerson weigh scale in the course of this research, 85.7 percent were 3-S2s.

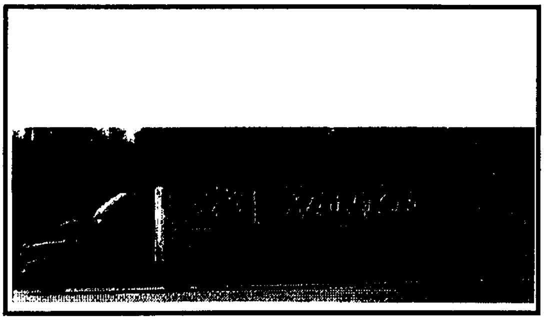
Body Type Variation with 3-S2 Trucks in the Corridor States



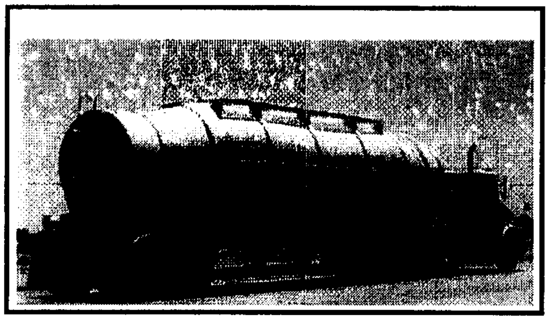
Drop deck - North Dakota



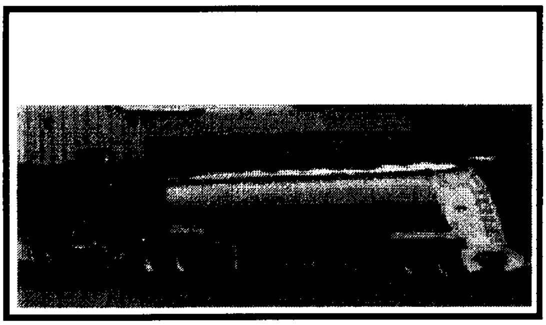
Flatbed with wide-base tires on all axles
Nebraska



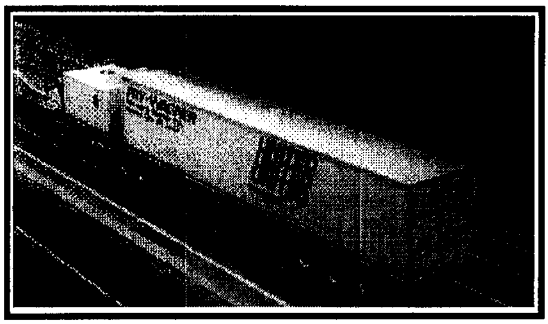
Dry van - Minnesota



Dry bulk tanker - Texas

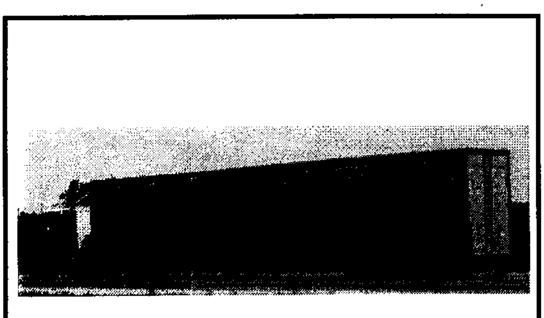


Tanker - Minnesota

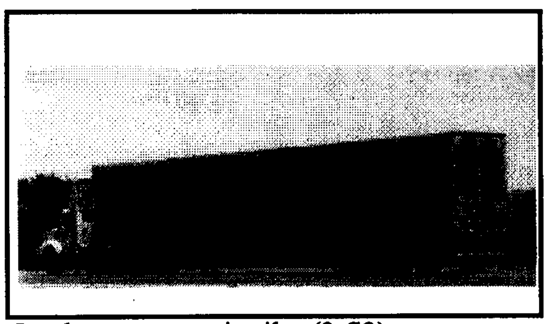


Van with drome box on tractor - Oklahoma

Longer Semitrailers in the Corridor States



4-axle tractor semitrailer (2-S2)
57' semitrailer - Texas



5-axle tractor semitrailer (3-S2)
57' semitrailer - Texas

Tridem Axle Semitrailers

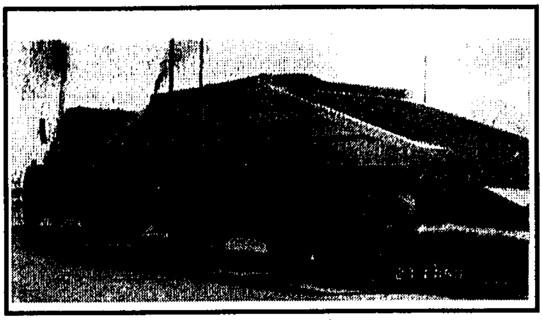
Six-axle tractor-semitrailer combinations (3-S3) are used in all the corridor States--albeit infrequently (generally less than one percent of the fleet of trucks which have five axles or more). Most of these 3-S3s are employed in hauling weight-out commodities, both on flat decks and in specialized bulk commodity vehicles. However, they are also used in cube-out operations. Notice the use of wide base tires on the 3-S3 dump truck in Minnesota, the 3-S3 gravel hopper-bottom in North Dakota, and the 3-S3 high-cube van in Kansas. In those corridor States where the GVW limits provide for the use of 3-S3s at a GVW greater than 80,000 pounds, more or less equivalent productivity from a weight perspective is available from lower tare weight 3-S2 split tandems. This tends to discourage greater adoption of 3-S3s. Of the 3,922 trucks surveyed at the Emerson weigh scale in the course of this research, 2.1 percent had tridem axle semitrailers.

Six-axle tractor-semitrailers are common in the Lower Rio Grande Valley of southern Texas. Many of these 3-S3s are employed in crossborder hauls of weigh-out commodities, both in flatbeds and in bulk commodity vehicles.

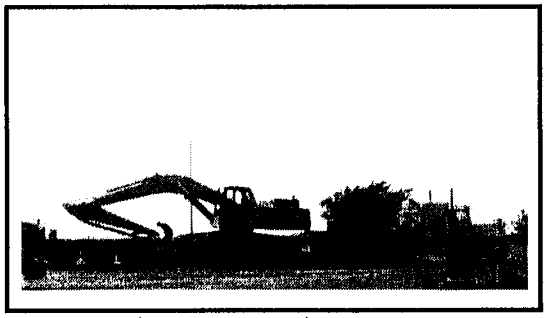
Straight Trucks

Straight trucks having 2, 3, 4, and 5 axles are operated throughout the corridor. They accounted for a high of 1 of 10 of the trucks surveyed along the I-35 in Minnesota, to a low of about 1 of 20 in Oklahoma. Of all trucks surveyed along the I-29, straight trucks accounted for 11.6 percent in North Dakota, 11.5 percent in South Dakota, and 7.5 percent in Iowa. Of the 3,922 trucks surveyed at the Emerson weigh scale in the course of this research, 2.7 percent were straight trucks. Many of the straight trucks with four or more axles, which see regular use in Minnesota and North Dakota and States to the south (and which are designed to satisfy the requirements of Bridge Formula B) are not permitted to operate in Manitoba unless their lift axles are raised.

Body Type Variation with Tridem Axle Semitrailers in the Corridor States



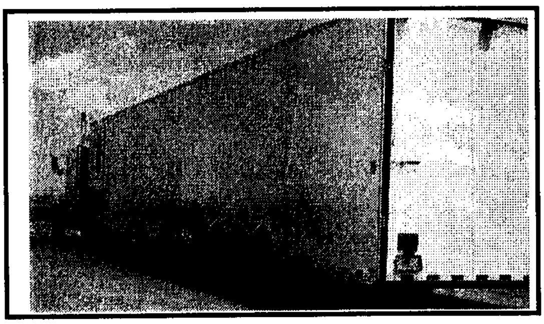
Gravel truck with single tires
North Dakota



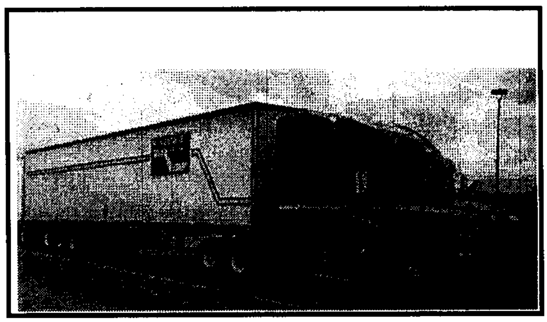
Low boy (4-axle tractor) - Iowa

Tanker - Minnesota

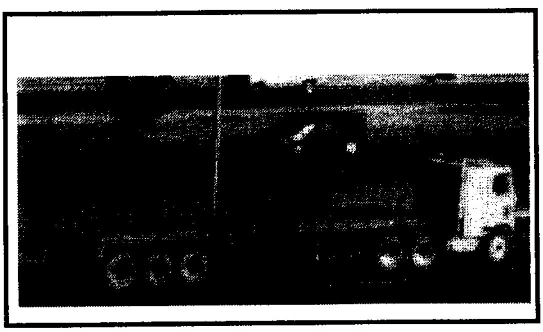
Dump truck with single and dual tires
Minnesota



High cube van - Kansas



Dry van - Oklahoma



Platform - Texas

Tanker - South Dakota

Straight trucks (specially 2- and 3-axle) are commonly used along and particularly across the U.S.-Mexico border. Many of these units are Mexico-based. [Ref. 3, p 24].

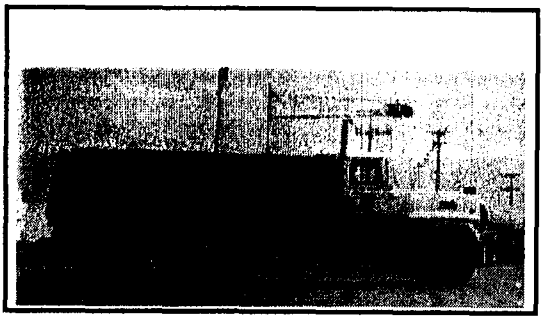
Lift Axles

As illustrated in the photos, the 4- and 5-axle straight trucks used in the corridor States employ a variety of arrangements of lift axles (pusher, tag or a combination of both), single versus tandem lift axles groups, single versus dual tires on the lift axles, outside versus inside positioning of the single tires on the lift axles, and low versus regular profile tires on the lift axles. Also, a variety of lift axle arrangements are used in tractor-semitrailer combinations operating principally in Minnesota. Most involve pusher axles on the semitrailer--typically single axles but sometimes tandem, using single or dual tires, and low or regular profile tires. Note also that 4-axle tractors with a pusher lift axle are utilized in a variety of combinations. These 4-axle tractors are products of Bridge Formula B, in States where the GVW limits are greater than 80,000-pounds. Of the trucks operating on the I-35 in Minnesota and classified in this research, 5.7 percent had lift axles--42 percent being on semitrailers and 57 percent being on straight trucks. Of the trucks operating on the I-29 and classified in this research, 2 percent had lift axles--56 percent being on semitrailers, 40 percent being on straight trucks and 4 percent being on truck trailer combinations.

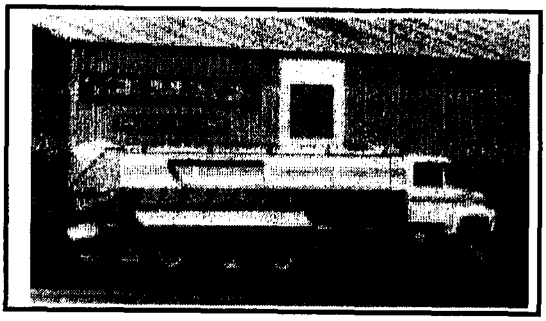
Split Tandems

A split tandem axle is created by increasing the spacing between the two axles in a tandem axle group from a typical standard of about 50 inches to 8, 9 or 10 feet. Split tandem axles are a common feature of trucking throughout the corridor States.

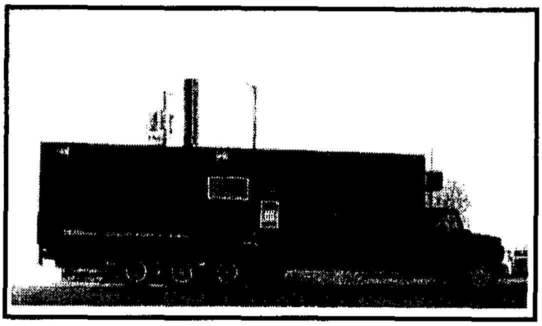
Split tandems have resulted from the combination of Federal axle weight limits and Bridge Formula B (and a wide range of similar bridge formulas in the corridor States). By increasing the spacing, instead of being considered a tandem axle with an axle weight limit



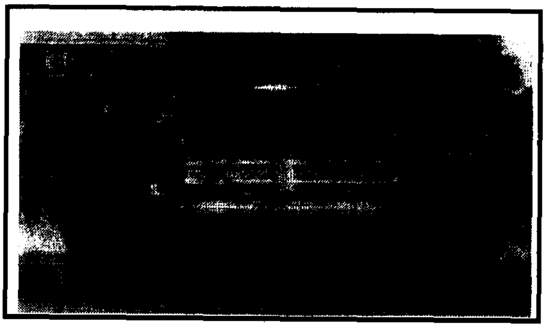
4-axle tag single - North Dakota



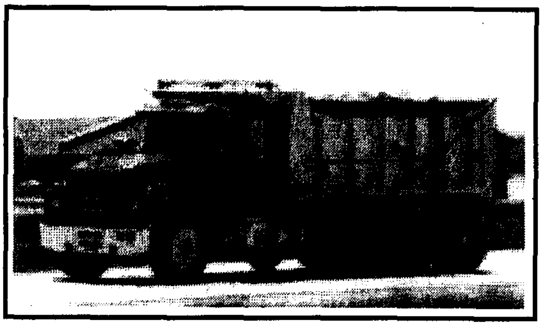
4-axle tag - Minnesota



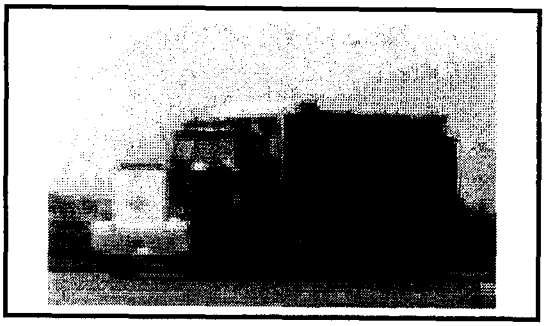
4-axle with lift tag - North Dakota



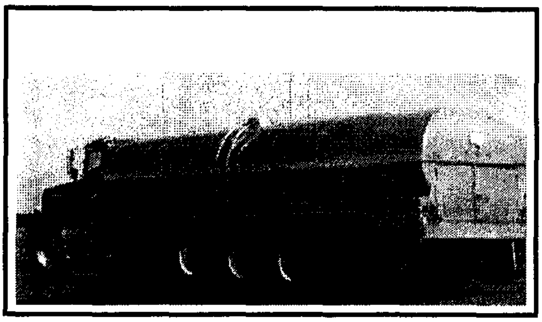
4-axle single tire, pusher - Minnesota



4-axle single pusher, small tire - Missouri



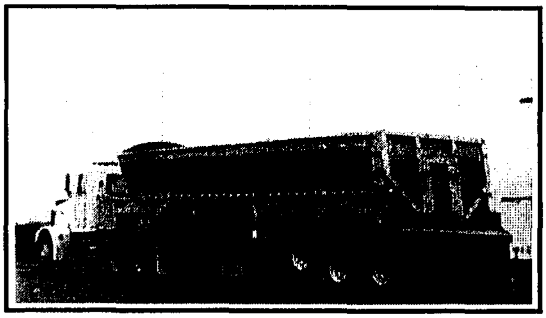
4-axle single pusher, small tire - Kansas



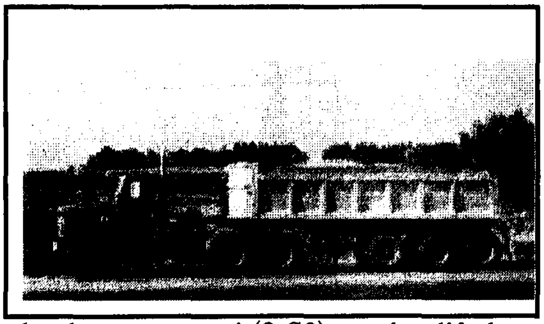
5-axle pusher single, tag single - Wisconsin

6-axle tandem pusher and trailing tag
Minnesota

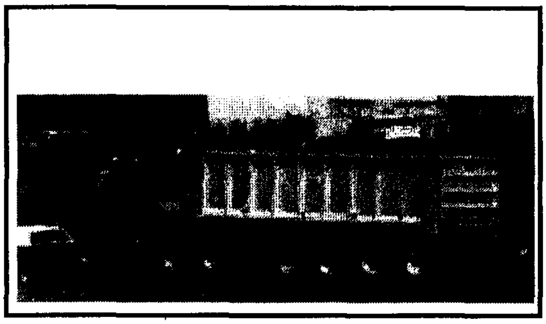
7-axle tractor semi (3-S4)--tandem pusher axle down - North Dakota



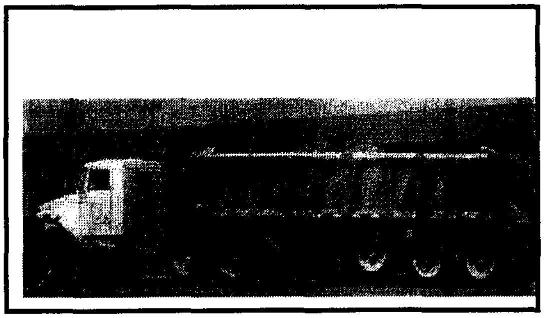
6-axle tractor semi (3-S3)--pusher lift up, wide base tires - Minnesota



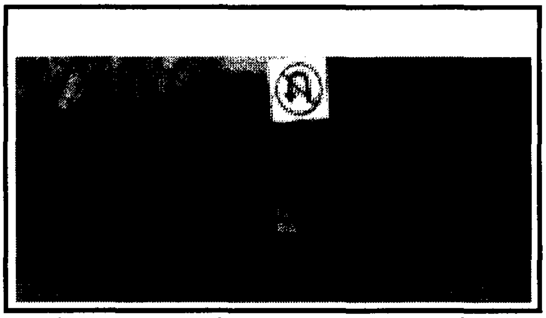
6-axle tractor semi (3-S3)--pusher lift down Minnesota



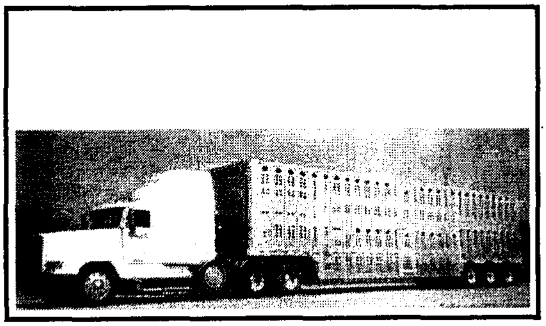
7-axle tractor semi (3-S4)--tandem pusher axle down - Minnesota



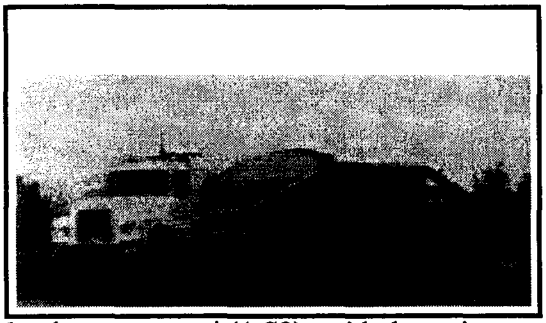
6-axle loaded tractor semi (3-S3) - Kansas



7-axle tractor semi (3-S4)--pusher tandem up, with single tires - Minnesota



7-axle tractor semi (4-S3) with pusher lift on tractor - South Dakota



6-axle tractor semi (4-S2)--wide-base tires and pusher lift on tractor - Iowa of 34,000 pounds, the split tandem is considered two single axles, subject to higher weight limits provided by Bridge Formula B (or a similar State bridge formula). Under Bridge Formula B, the combined weights allowed on two axles as a function of spacing are: (1) 38,000 pounds at more than 8 feet; (2) 39,000 pounds at 9 feet; and (3) 40,000 pounds at 10 feet or greater.

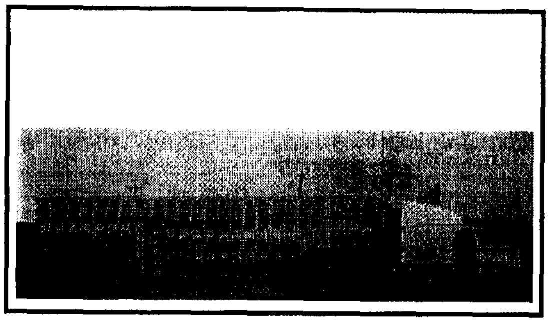
Split tandems on 3-S2s facilitate "water level" loading (*i.e.* loading freight in a trailer at a constant height) and permit taking advantage of a GVW limit greater than 80,000 pounds--as it is on many IS and non-IS highways in the corridor States, by regulation, by permit, and by season. Split tandems are used in each of the corridor States. From the on-road vehicle classification survey reported in Section 3.4.2, 1 of every 19 3-S2 configurations observed on the I-35 uses a split tandem on the semitrailer. They are most commonly--but not exclusively--used on flat beds. About one-third of all 3-S2 flatbeds observed in this classification survey used split tandems. Of all 3-S2s surveyed along the I-29 in this research, 1 of every 16 had a split tandem on the semitrailer. Nearly 90 percent of these split tandem axles were on flat deck semitrailers.

Grain Trucking

Grain trucking is a particularly important component of total trucking activity between Manitoba and the U.S., and within the northern States in the corridor. The wide range of combinations used in grain trucking are illustrated in the photos. They include multi-axle truck + trailer combinations, a variety of tractor-semitrailers (2-S2s, 3-S2s, 3-S3s), A-trains, and B-trains. Of the 3,922 trucks surveyed at the Emerson weigh scale in the course of this research, grain trucks accounted for 16.3 percent.

Body Type Variation with Split Tandems in the Corridor States

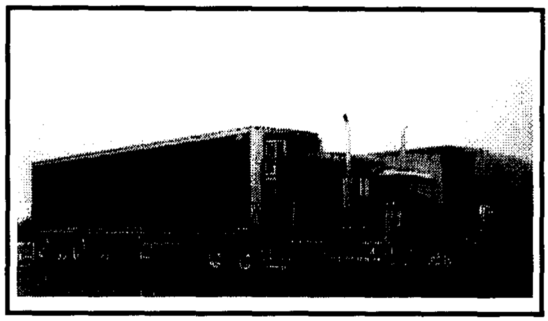

North Dakota


South Dakota


Minnesota


Minnesota

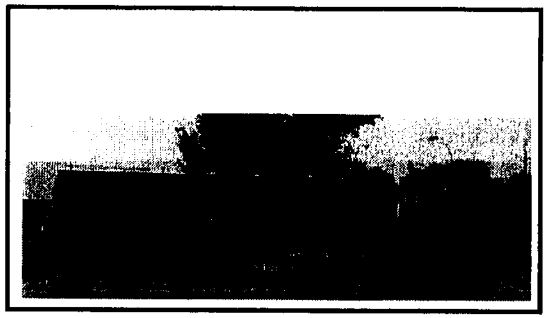

Iowa


Kansas

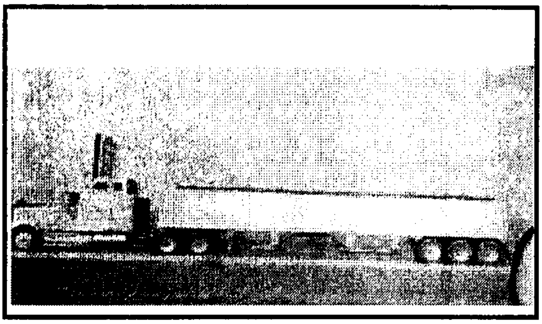

Texas


Wide-base tires - Texas

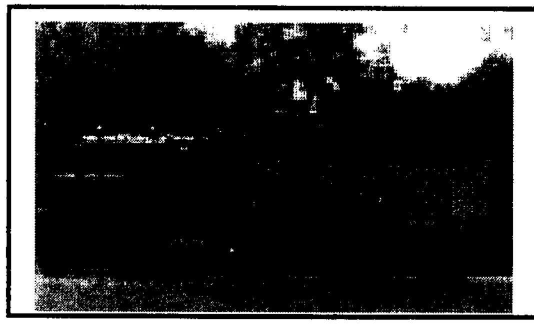
5-axle tractor semi (3-S2) - Nebraska



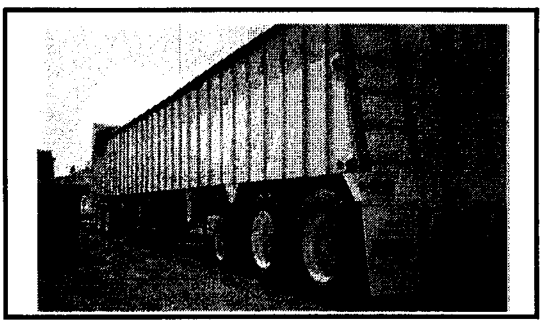
4-axle tractor semi (2-S2) - Nebraska



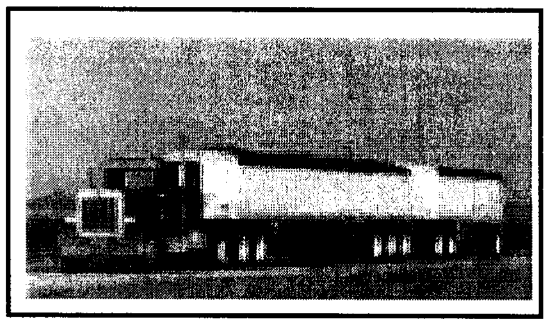
6-axle tractor semi (3-S3) - South Dakota



6-axle tractor semi (3-S3), tag single lifted
Nebraska

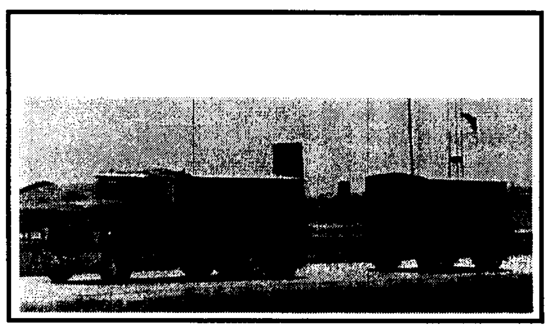


6-axle tractor semi (3-S3) with pusher
low profile - North Dakota



Rocky Mountain Double (4-S3-3) with
pusher lift on tractor - South Dakota

3+2 truck trailer - Minnesota



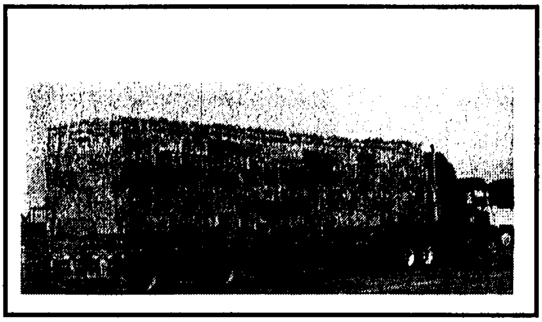
3+2 truck trailer (split tandem) - Missouri

Specialized-Commodity Hauling

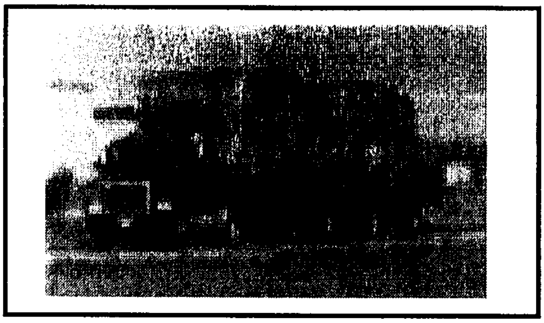
As with grain trucking, there are a wide variety of specialized-commodity haul trucks used between Manitoba and the U.S., and within the northern States in the corridor. The combination of TS&W regulations in these northern corridor States, coupled to requirements to comply with the State bridge formulas has created a series of configurations and axle arrangements unique to this region.

Containers

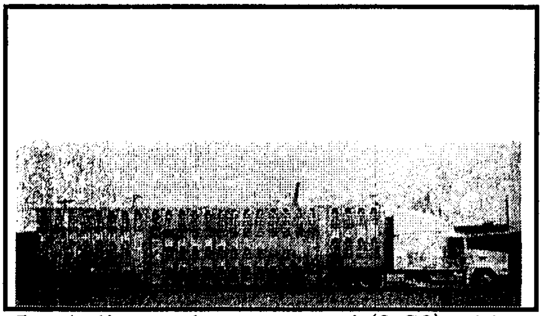
The trucking of both international and--in larger quantities--domestic containers, occurs throughout the corridor. International containers are typically hauled on 3-S2 flat beds, sometimes utilizing split tandems (as shown in the photos); presumably to ease problems of weight distribution. When trucked, domestic containers are typically hauled on specially-designed container chassis (as shown in the photos at International Falls). From the truck fleet classification studies reported in Section 3.4.2, about 1.9 percent of the surveyed trucks operating on the I-35 with five axles or more were hauling containers (about 1 of 5 being an international container, and 4 of 5 being a domestic container). About 0.8 percent of the surveyed trucks operating on the I-29 with five axles or more were hauling principally international containers. Of the 3,922 trucks surveyed at the Emerson weigh scale in the course of this research, 0.4 percent were handling containers.



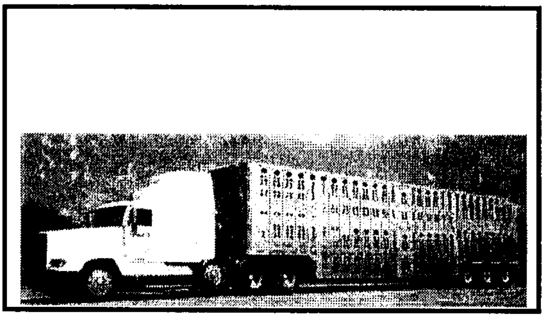
5-axle tractor semi (3-S2) with split tandem hauling hay - Fargo, North Dakota



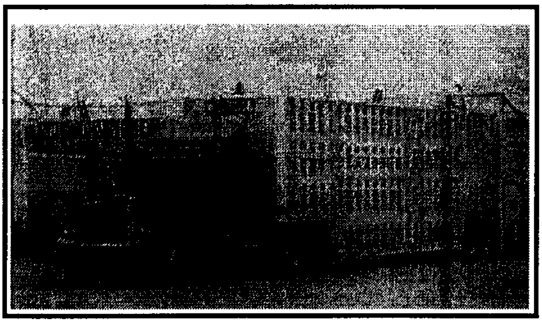
7-axle tractor-double trailer (3-S2-2) hauling hay, South Dakota



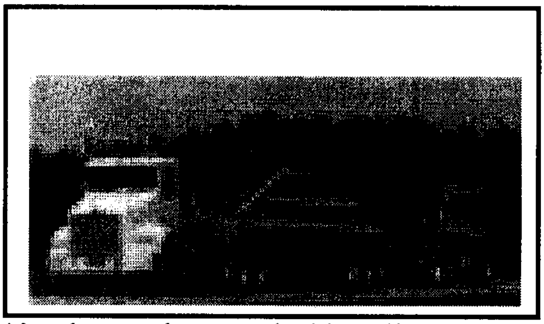
5-axle livestock tractor semi (3-S2) with split tandem - South Dakota



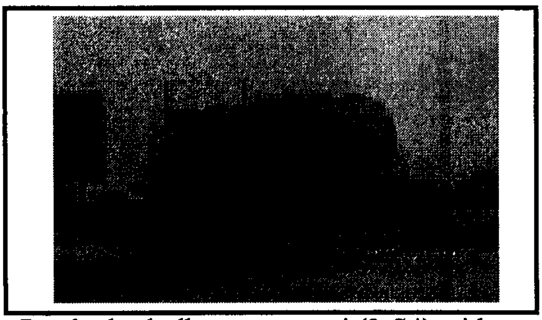
7-axle livestock tractor semi (4-S3) with pusher lift on tractor - South Dakota



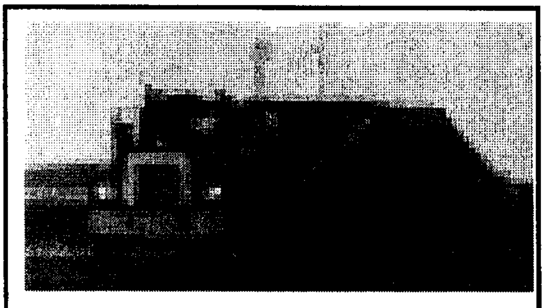
5-axle livestock tractor-semi (3-S2) South Dakota



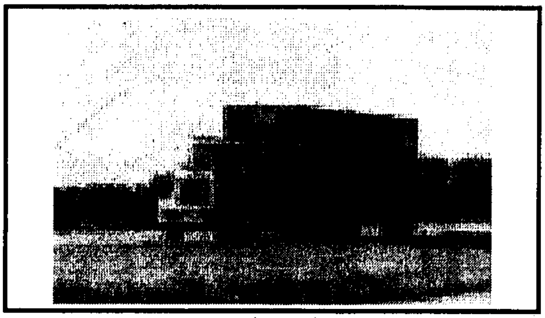
10-axle gravel tractor-double trailer (4-S3-3) with pusher lift on tractor - South Dakota



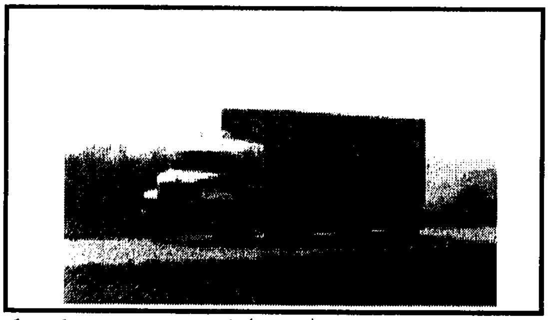
7-axle dry bulk tractor-semi (3-S4) with wide-base tires - Iowa



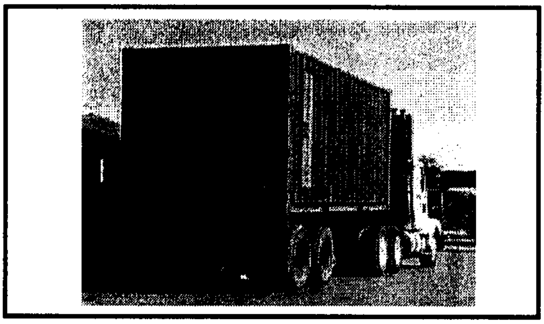
7-axle gravel tractor semi (4-S3) with wide-base tires and pusher lift on tractor South Dakota



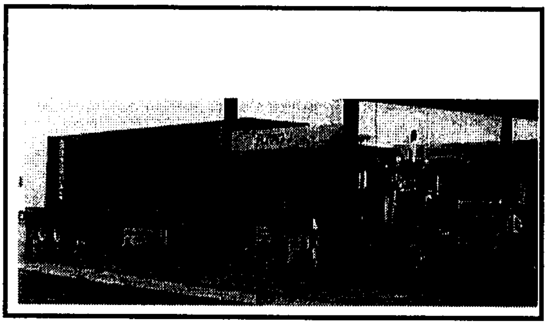
5-axle tractor semi (3-S2) with 40' container
North Dakota



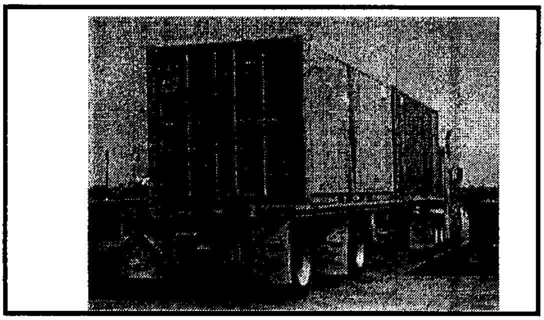
6-axle tractor semi (4-S2) with 40' container
and pusher lift axle on tractor-Nebraska



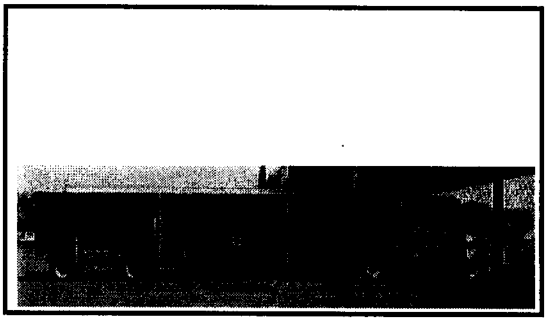
5-axle tractor semi (3-S2) with 20' container
Missouri



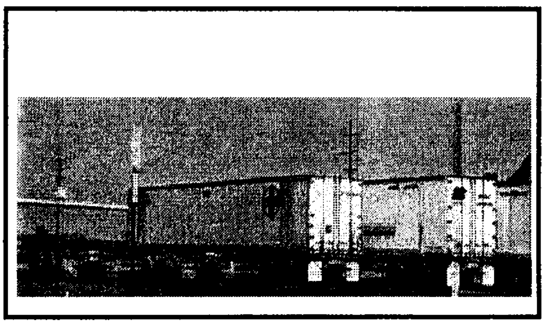
5-axle tractor semi (3-S2) with 40' container
Oklahoma



5-axle tractor semi (3-S2) with split tandem
and two 20' containers - Kansas



5-axle tractor semi (3-S2) with split tandem
and two 20' containers - Iowa



Domestic Containers
International Falls, Minnesota

5-axle tractor semi (3-S2) with 48' container
I-35 Laredo, Texas

Long-Combination Vehicles

North Dakota, South Dakota, Nebraska, Kansas and Oklahoma permit the operation of large double and triple trailer combinations on selected highways. Certain of these units are also permitted restricted operation in Missouri in the "commercial zone" adjacent to Kansas City. The photos show examples of a Rocky Mountain Double, a variety of turnpike doubles (twin-48 foot trailers, 1-48 foot plus 1-53 foot trailers, twin-53 foot trailers), and standard 2-S1-2-2 triples operating in the corridor States.

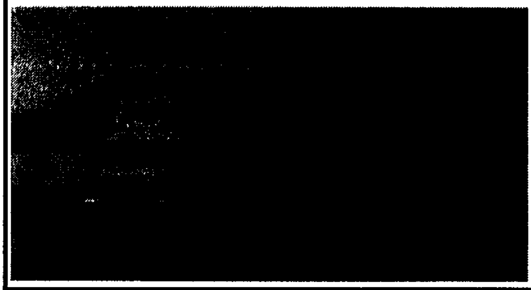
STAA Western Doubles

Of combinations with five or more axles, STAA double trailer combinations (2-S1-2s and 3-S1-2s) account for 1 to 2 percent of the registered fleet in the corridor States and 1 to 3 percent of the fleet observed operating on the I-35 and the I-29 in the classification studies conducted in this research. These are effectively all standard twin-28 foot van operations. As illustrated in the photos, variations include the California dry bulk tanker, a high cube 3-S1-2 household goods carrier, and a mixed combination of a van plus a 3-axle flat deck trailer.

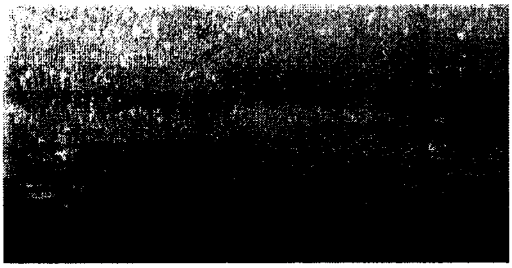
The bulk STAA doubles so common to California are infrequently seen in the Mid-continent corridor States. However, in California they are used for both weigh-out bulk haul operations (dry and liquid tankers, hoppers), flatbed operations, and LTL operations. Discussions with California truckers indicated that many of the 2-S1-2 bulk combinations achieve very low tare weights (as low as 23,000 pounds) and very high payloads (as high as 57,000 pounds) within California's 80,000 GVW cap. [Ref. 3, p 27].

Large Doubles Operating in the Corridor States

9-axle tractor-double trailer (3-S2-4)
two 48' trailers - South Dakota

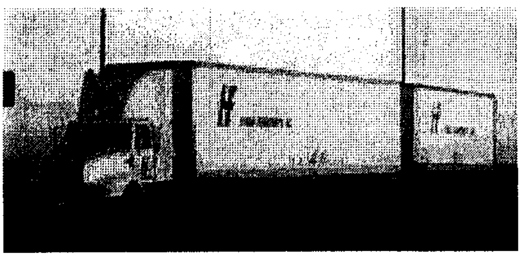


9-axle tractor-double trailer (3-S2-4)
two 48' trailers - Oklahoma

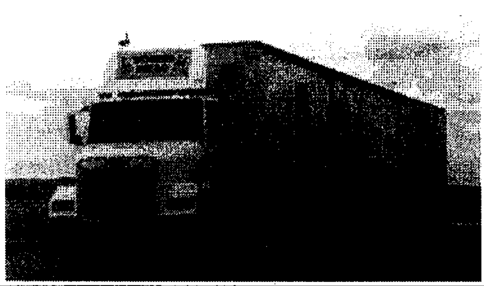


8-axle tractor-double trailer (3-S2-3)
one 53' and one 48' trailer - Kansas

7-axle tractor-double trailer (2-S2-3)
two 53' trailers - Oklahoma

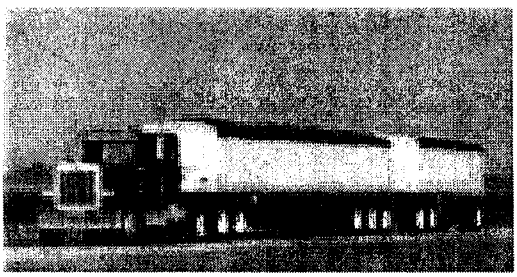


Rocky Mountain Double (3-S2-2)
North Dakota



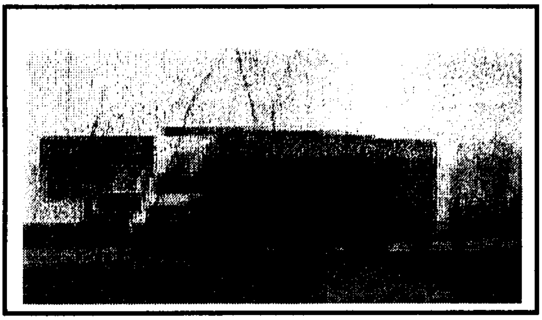
Rocky Mountain Double (3-S2-2)-- one 48' and one 28' trailer - Oklahoma

12-axle tractor-double trailer (3-S3-6) with wide-base tires on all axles - South Dakota

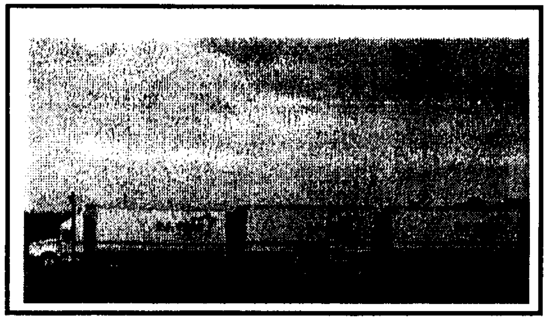


Rocky Mountain Double (4-S3-3) with pusher lift on tractor - South Dakota

Triples Operating in the Corridor States



7-axle tractor-triple trailer (2-S1-2-2)
North Dakota



7-axle tractor-triple trailer (2-S1-2-2)
Kansas

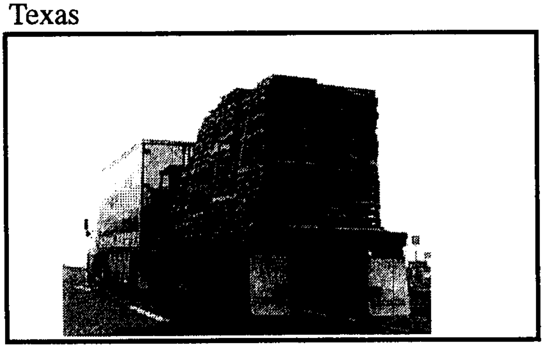
7-axle tractor-triple trailer (2-S1-2-2)
Oklahoma

Staging area - Kansas Turnpike (south end)
Kansas

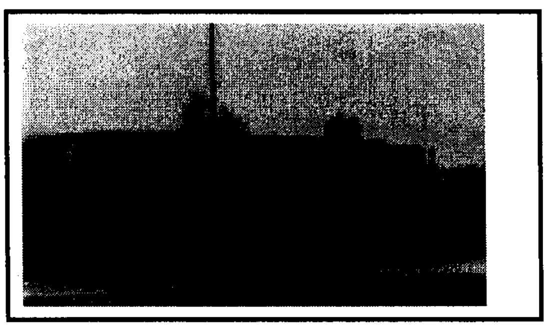
STAA Doubles Operating in the Corridor States

5-axle A-train (2-S1-2) dry bulk tanker
Texas

5-axle (2-S1-2) van - Minnesota



6-axle (2-S1-3) van and platform - Iowa



6-axle (3-S1-2) high cube van - Iowa

Truck + Trailer Combinations

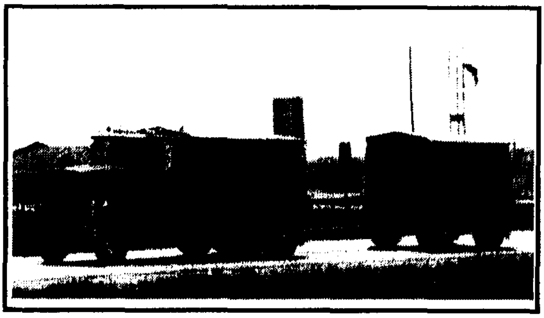
A variety of truck + trailer combinations with unique characteristics operate in all the corridor States, but most particularly in Minnesota, Iowa, Missouri, North Dakota, and South Dakota. These combinations include various axle groups and spreads on the trailers (tandems with close spread, 8-foot spread, and more than 10-foot spread, tridems, and 5- and 6-axle trailers in South Dakota) and various tire arrangements (duals, single and dual, wide base tires, and low versus regular profile). They are bridge-formula designed (not necessarily Bridge Formula B, however). Many require long-tongues (sometimes very long tongues) to provide the necessary wide outer bridge. The intended load distribution properties of some of these units is not obvious.

Trucking in Manitoba

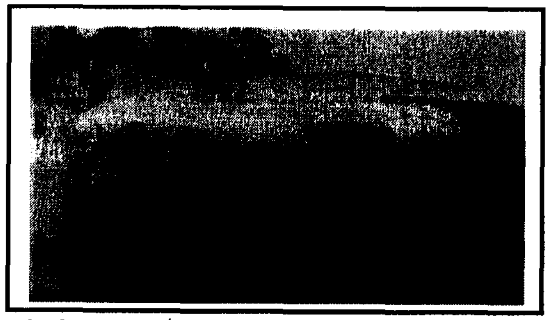
A variety of truck configurations operate in Manitoba. The fleet is dominated by 5-axle tractor semitrailers. However, there are other configurations that are also significant. These include tridem-axle semitrailers, 7- and 8-axle A and B-trains, standard STAA doubles, and straight trucks (mainly 2-and 3-axle). Tractor-triple trailer combinations have recently been allowed to operate on designated highways in Manitoba. The dominant trailer types in Manitoba are the vans and the flatbeds, as shown in the photos.

Trucking in Mexico

A variety of truck configurations operate in Mexico. There is a large preponderance of 2- and 3-axle straight trucks. However, 5-axle tractor-semitrailers dominate the fleet. The photographs show a range of body types and configurations of truck operating on Mexican highways. These include 6-axle tractor-semitrailers, 9-axle double trailer combinations (3-S2-4s), 6-axle auto transporters. The photographs also show a J.B. Hunt 5-axle tractor semitrailer operating in central Mexico.

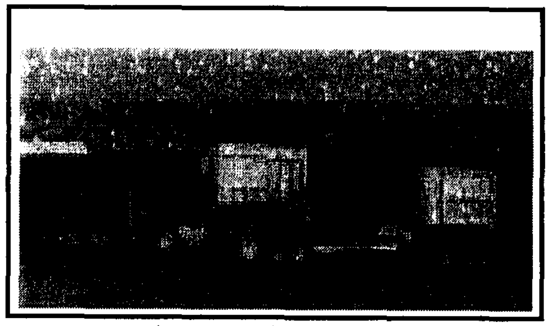


3+2 Dump (split tandem) - Missouri

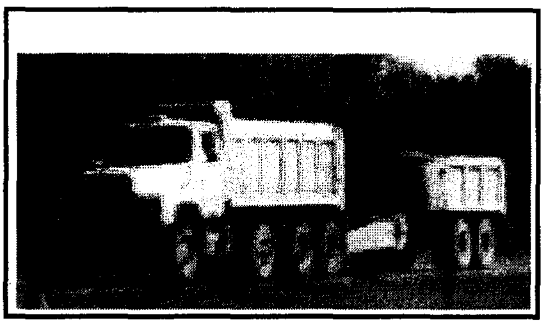


3+3 tanker (single tires on trailer)
South Dakota

3+2 Dump (close tandem), Missouri

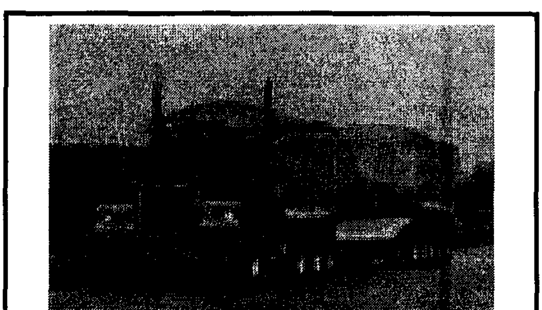


4+3 Dump (dual tires) - Iowa

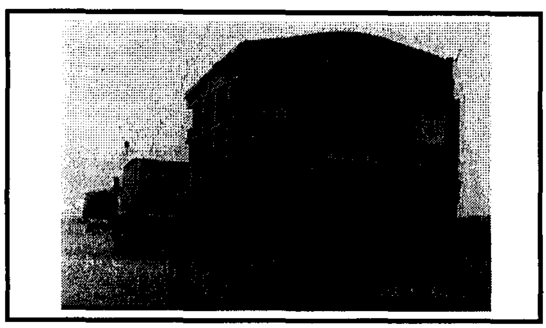


4+2 Dump (lift, close tandem) - Minnesota

3+3 Dump and Flat - Minnesota

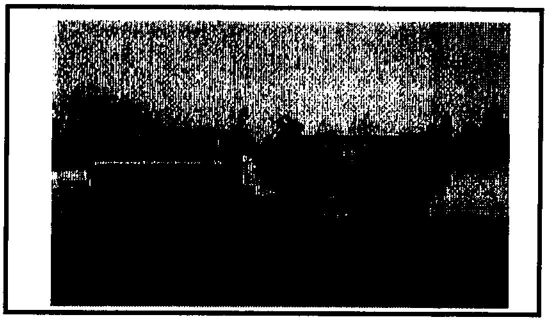


5+6 Dump with pusher lift on truck and
low profile on trailer - South Dakota



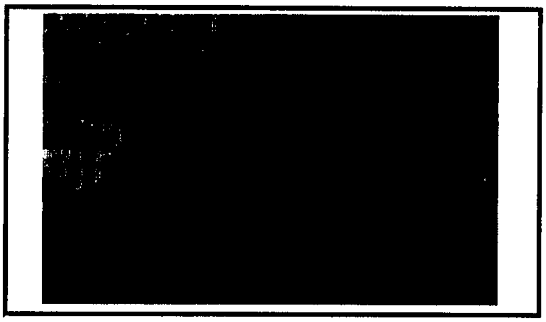
3+5 Dump (single and dual tires on trailer)
South Dakota

Trucking in Manitoba



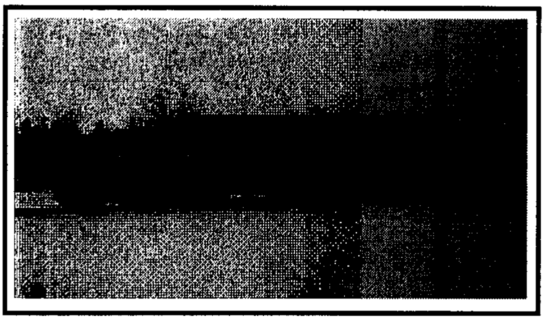
2- axle straight truck

5-axle (3-S2) flat bed

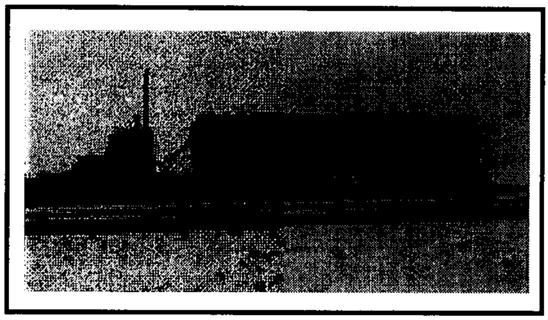


4-axle straight dump truck
with wide-base tires

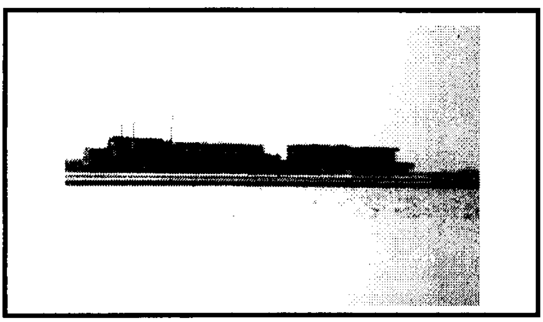
5-axle (2-S3) grain truck



6-axle (3-S3) livestock



6-axle (3-S3) tank truck

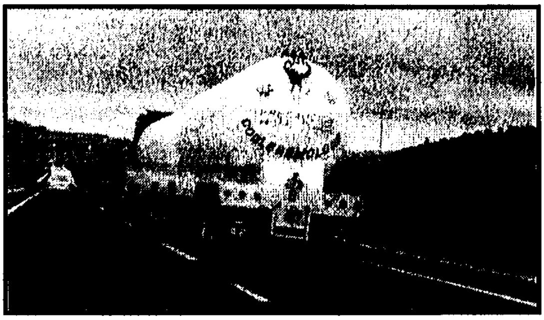


8-axle (3-S3-S2) flat bed super B-train

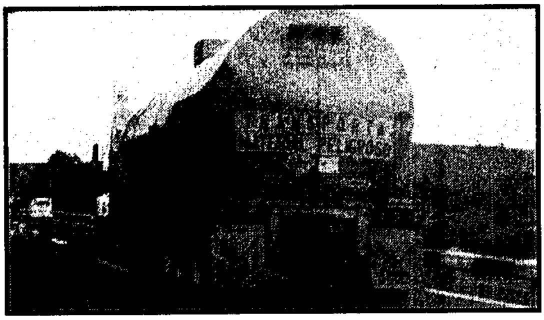
3-Tandem jeep-S3

Trucking in Mexico

5- axle tractor semi (3-S2) tank truck
Federal Highway 57 (Mexico-Querétaro)

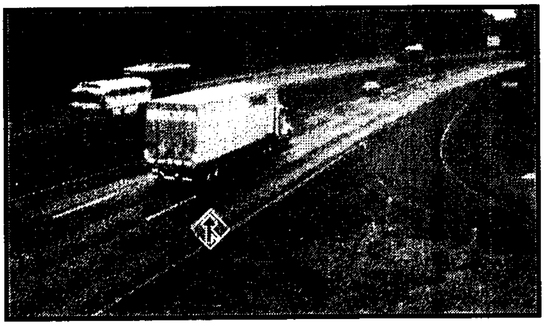


9-axle (3-S2-4) tank truck
Federal Highway 57 (Mexico-Querétaro)



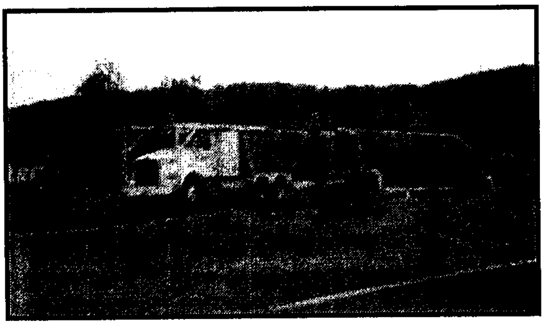
6-axle tractor semi (3-S3) tank truck
Federal Highway 57 (Mexico-Querétaro)

6-axle tractor semi (3-S3)
Federal Highway 57 (Mexico-Querétaro)

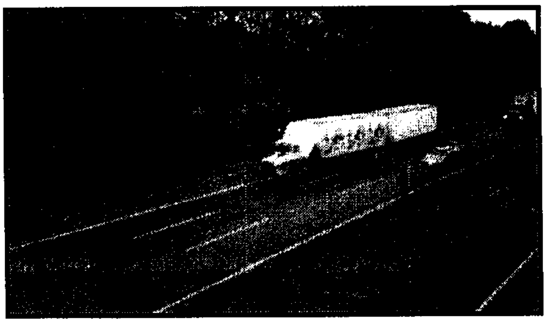


5-axle tractor semi (3-S2) van (J.B. Hunt)

3-axle straight truck



6-axle auto transporter



9-axle (3-S2-4) van

Source: Montufar, Jeannette and Clayton, Alan. "United States-Mexico Crossborder Case Study". November, 1996

3.8 Summary

This chapter presents characteristics about trucking activity in the corridor of potential relevance to the consideration of TS&W policy options.

3.8.1 Truck Combinations Used in the Corridor

The TS&W regulations applicable in the nine corridor States lead to the use of a wide variety of truck configurations operating in, to and from, and across the corridor States. Some are quite unique, such as: (1) the long-combination vehicles operating in North Dakota, South Dakota, Nebraska, Kansas and Oklahoma; (2) combinations involving long (57-59.5 foot) semitrailers; (3) 15-foot vehicle heights in the commercial zones of Missouri; (4) lift axles (particularly dominant in Minnesota and Iowa); (5) various configurations using wide-base tires; and (6) six-axle tractor-semitrailer combinations along and across the Texas-Mexico border in the Lower Rio Grande.

Small trucks with four or less axles dominate the registered truck fleets in the corridor States, ranging from 69 percent in Texas to 87 percent in North Dakota (81 percent nationwide). Of the trucks that have five or more axles:

- Tractor-semitrailer combinations are most common, ranging from 88 percent in North Dakota to 96 percent in Oklahoma (87 percent nationwide). This tractor-semitrailer fleet consists principally of conventional five-axle units, five-axle units with a split tandem axle on the semitrailer (particularly common on flatbeds), a small number of six-axle tractor-semitrailers, and a very small number of seven-axle tractor-semitrailers.
- Truck-trailers are the next most common--3 percent in Oklahoma to 10 percent in Minnesota (7 percent nationwide).
- Tractor-double trailer combinations follow--less than one percent in Nebraska to 4 percent in North Dakota (5 percent nationwide).

- In the nine corridor States, there are very few tractor-triple trailer combinations.

State-developed vehicle classification data concerning operations on the I-29 were available for South Dakota and for Iowa. Data for I-35 were available for Iowa, Kansas, Oklahoma and Texas. Of the observed fleets:

- For South Dakota: (1) straight trucks account for between 12 percent (north of State highways 15) and 22 percent (north of Exit 4); (2) five-axle tractor-semitrailers account for between 48 and 55 percent; (3) double trailer combinations account for between 2 and 5 percent; and (4) six-axle tractor-semitrailers account for between 2 and 10 percent.

- For Iowa on I-29: (1) straight trucks account for between 9 and 26 percent; (2) five-axle tractor-semitrailers account for between 56 and 63 percent; (3) double trailer combinations account for about 5 percent; (4) three- and 4-axle tractor-semitrailers account for between 12 and 20 percent; and (5) six-axle tractor-semitrailers and truck+trailers are uncommon, accounting for between 1 and 2 precent.

- For Iowa on I-35: (1) straight trucks account for between 12 percent (at the Iowa-Missouri border) and one-quarter (on the Des Moines bypass); (2) five-axle tractor-semitrailers--one-half to 60 percent; (3) double trailer combinations (STAA and all others)--about 5 percent; (4) 3/4-axle tractor-semitrailers and truck + trailer combinations--15 to 19 percent; (5) six-axle tractor semitrailers and truck + trailer combinations are uncommon, accounting for between 1.5 and 2 percent.

- For Kansas: (1) straight trucks (principally 2/3-axle, with some 4/5-axle)--10 to 15 percent, except close to Kansas City where they account for one-third to about 40 percent; (2) five-axle tractor-semitrailers--40 to 60 percent close to urban areas, and one-half and three-quarters away from urban areas; (3) 3/4-axle tractor-semitrailers and truck + trailer combinations--6 percent (away from urban areas) to nearly one-quarter (close to urban areas); (4) STAA double trailer combinations--3 to 5 percent on urban interstates, and about 5 and 9 percent on rural interstates; (5) configurations with tridem axles are uncommon--about 2 percent.

  Large double trailer combinations having 7 or more axles account for: (1) about 2 percent of the truck traffic on the I-70 just west of Kansas City (about 125 units per day); (2) about 13 percent of the truck traffic on the I-335 between Topeka and Emporia (about 175 units per day); (3) about 2.5 percent of the truck traffic on the (rural) I-70 between Lawrence and Topeka (about 100-110 units per day); and (4) about 4 percent of the truck traffic on the I-35 close to Wichita (about 80 units per day).

- For Oklahoma: (1) straight trucks (effectively all 2/3-axle)--10 to 15 percent at rural sites, and about one-quarter near Oklahoma City; (2) five-axle tractor-semitrailers (combined with some 6-axle units)--about two-thirds at urban sites, and nearly 80 percent at rural sites; (3) double trailer combinations (STAA and all others)--1 to 4 percent; (4) 3/4-axle tractor-semitrailers and truck + trailer combinations--3 to 6 percent at all locations.

- For Texas: (1) straight trucks (effectively all 2/3-axle)--30 percent (from about 15 percent in Laredo to more than 40 percent on the south side of Fort Worth); (2) five-axle tractor-semitrailers--about 60 percent (from about three-quarters at Laredo to about 47 percent on the south side of Fort Worth); (3) STAA double trailer combinations--1 to 5 percent at all locations; (4) 3/4-axle tractor-semitrailers and truck + trailer combinations--6 to 8 percent.

Truck classification surveys were conducted along the full length of I-29 and I-35 and on selected sections of major inter-connecting routes during three field trips (April 28 to May 2, 1996; May 27 to June 1, 1996; and August 26 to August 30, 1996). These surveys provide insights into on-road vehicle characteristics that cannot be obtained from the TIUS registration-based data or automated classification monitoring. In particular: (1) configurations are more specifically defined; (2) configurations are related to body type; (3) trailer lengths are established; (4) the incidence of split tandems is established; and (5) the role of lift axles is established.

Of 1,282 trucks observed operating on the I-29 during the survey periods:

- Straight trucks (principally with 2 and 3 axles, and some with 4 or 5 axles) accounted for 10.4 percent of the trucks classified during the survey. They were most prevalent in South Dakota (11.5 percent of the observed fleet in that State) and least prevalent in Iowa (7.5 percent of the observed fleet).

- Of the 1,121 surveyed trucks with five or more axles: 89.7 percent were 3-S2s; 2.2 percent were STAA doubles (mainly 2-S1-2s); 3.8 percent were tridem-axle semitrailers; 0.4 percent were 3-S4s; another 0.4 percent were triples; 0.3 percent were B-trains; other configurations accounted for 3.2 percent.

- Of the 1,015 surveyed 3-S2s: six percent had a split tandem axle; 8.6 of 10 split tandems were on platforms.

- Vans accounted for almost one-half (49.2 percent) of the classified trucks; platforms accounted for 13.0 percent; hopper bottom bodies accounted for 19.0 percent; liquid tankers accounted for 5.7 percent; livestock trucks accounted for 4.5 percent; and other body types accounted for 8.6 percent.

- Of 631 vans, almost one-quarter were equipped with reefers. The State where most of the insulated refrigerated vans were observed was Iowa (28.0 percent of the vans in the State). In North Dakota, insulated refrigerated vans accounted for 18.0 percent; and in South Dakota they accounted for 22.2 percent.

- Of 1,282 trucks classified in North Dakota, South Dakota and Iowa, 2.0 percent (25 trucks) were equipped with lift axles. The State where most of the lift axles were observed was South Dakota (48 percent of the total observations in the three States). Lift axles are almost as common in North Dakota (10 of 25 observations). Only 3 trucks equipped with lift axles were observed in Iowa.

Of 8,050 trucks observed operating on the I-35 during the survey periods:

- Straight trucks (principally with 2/3 axles, and some with 4 or 5 axles) accounted for 7.3 percent of the trucks classified during these survey periods. They were most prevalent in Minnesota (10.5 percent of the observed fleet) and least prevalent in Oklahoma (4.4 percent of the observed fleet). No 4/5-axle straight trucks were observed in Kansas, Oklahoma or Texas.

- Of the surveyed trucks with five or more axles: (1) 95.6 percent were 3-S2s; (2) 3.0 percent were STAA doubles (mainly 2-S1-2s); (3) 0.9 percent were tridem axle semitrailers; and (4) 0.2 percent were truck + trailers with 5/6 axles.

- Of the surveyed 3-S2s, 1 of 19 had a split tandem axle. Nine of 10 split tandems were on platforms. About one-third of platforms had split tandems.

- Vans accounted for two-thirds (65.8 percent) of the classified trucks; platforms accounted for 14.0 percent; weight-out specialized body types (grain, gravel, dump) accounted for 7.4 percent; liquid and dry bulk tankers accounted for 6.1 percent; containers (principally domestic) on flatbeds accounted for 1.8 percent.

- Of 3-S2 tractor-semitrailer combinations with vans, nearly one-quarter had semitrailers which were 53 feet or longer. The percentage of 53 feet or longer semitrailers was smaller (about 1 of 10) Minnesota and Iowa, and larger in Missouri and Oklahoma.

- Effectively all of the observed STAA doubles are vans.

- Nearly 1 of 5 of the observed vans is equipped with a reefer. This ranges from a low of about 10 percent in Minnesota to about one-quarter of all vans in Kansas and Oklahoma.

Similar patterns are evident in the survey results pertaining to an additional 2,632 trucks observed on interstates connecting with the I-35.

An extensive survey was conducted at the Emerson Scale in Emerson, Manitoba between February and August, 1996. This survey provided valuable information to better understand truck activities to and from Manitoba.

Of the total 3,922 trucks that were classified:

- The fleet is as follows: 2-, 3-, and 4-axle straight trucks combined account for 2.7 percent; 3-S2s account for 85.7 percent; 3-S3s account for 2.1 percent; 7- and 8-axle B-trains combined account for 1.8 percent; other configurations account for 7.7 percent.

- Almost 40 percent of the B-trains are grain bodies. About one-third are tank trucks with liquids or gas. A-trains are almost as common as B-trains. They account for about one percent of the total fleet. One-half of the A-trains are vans.

- Vans account for 42.7 percent of the fleet (one-quarter of those vans are equipped with refrigerating units); flat beds account for 18.9 percent of the trucks surveyed; grain bodies account for 16.3 percent; livestock trucks account for 9.5 percent; other body types account for 12.6 percent of the trucks surveyed. Table 3-4 shows the truck fleet distribution by configuration and body type for all trucks classified.

- The truck plus trailer fleet is minimal. Less than one percent of the classified trucks were truck plus trailers with 4, 5 or 6 axles.

- Straight trucks are the second most common configuration observed at the Emerson scale, accounting for almost three percent of the total fleet. Almost three-quarters of the straight truck fleet operates with vans.

Another source of information that assisted in the understanding of truck activity in the corridor is a Manitoba-based truck load carrier survey conducted in October, 1996 in Winnipeg, Manitoba. Nine of the major carriers were surveyed and the following was found:

- In terms of the fleet size, the nine carriers operate a combined fleet of about 2,160 tractors and 4,425 trailers, for an average trailer-to-tractor ratio of about 2.

- Approximately 80 percent of the trailers are vans. More than one-quarter of these are equipped with refrigerating units. Flat beds account for about 10 percent of the trailers. Other body types (e.g. hopper bottom, dry bulk and liquid tanks) account for the remaining 10 percent of the trailer fleet.

- More than one-half of the trailers are 53 feet in length, about 45 percent are 48 feet and the remaining are other lengths, less than 48 feet. All new semitrailers in the past year have been 53-footers for most of the companies. The standard trailer width is 102 inches and the standard van height is 13.5 feet. Most of the fleet consists of tandem-axle semitrailers.

3.8.2 Truck Usage in the Corridor States

The importance of local and regional commodity movements is reflected in the TIUS truck usage data for all corridor States. One-quarter of the corridor States' 875,000 trucks of interest are used principally for the transportation of farm products. An additional 39 percent are used principally for the transportation of building materials, processed foods, petroleum, and live animals. Other important principal product handlings are transportation equipment, machinery, mixed cargoes, chemicals, fabricated metals, and scrap/refuse.

Most trucks in the corridor States operate most of their mileage within their base State (9 of 10 trucks drive less than 25 percent of their mileage outside of the home State). About 1 of 18 trucks drive from 75 to 100 percent of their mileage outside the base State. Further, most of these trucks operate most of their mileage within 200 miles of home (9 of 10 typical truck trip lengths are within this distance of home or off-the-road). About 1 of 21 trucks operate in the 200 to 500 mile range, with another 1 of 13 having trip lengths greater than 500 miles.

This heavy concentration of trucking on intra-State operations and short haul lengths is evident in each of the nine corridor States.

Most trucking in the corridor States occurs at weight levels that are much lower than the governing GVW limits. Effectively all trucking occurs at weight levels requiring five or less axles. About 7 of 10 truck movements occur at an average GVW of less than 40,000 pounds, which generally requires no more than three axles; 84 percent occurs at average weight levels less than 60,000 pounds GVW, which generally requires no more than four axles; 99 percent occurs at average weight levels less than 80,000 pounds GVW, which generally requires no more than five axles. Hardly any trucking occurs at weight levels requiring more than five axles. About 0.5 percent occurs at GVWs between 80,001 and 100,000 pounds, probably requiring six or seven axles. Less than 0.01 percent occurs at GVWs greater than 100,000 pounds, probably requiring eight or nine axles.

3.8.3 Truck Flows in the Corridor States

A map of truck flows for all NHS highways in the corridor States was developed in this research using State-based volume data.

- East-west truck movements are much larger than north-south truck movements in the corridor States.
- The lowest truck volumes along the I-29 route occur south of the Manitoba-U.S. border--approximately 450 average annual daily truck traffic (AADTT). The highest truck volumes occur just north of Omaha, Nebraska--approximately 2,980 AADTT.
- The lowest truck volumes along the I-35 route occur at its two ends (between Minneapolis and Duluth--1,450 AADTT and between Laredo and Cotulla--1,700 AADTT) and in its middle on the east side of Wichita--1,750 AADTT.
- Most of the north-south trucking activity takes place between Oklahoma City and San Antonio. Dallas-San Antonio is the link that shows the highest truck volumes in the I-35 corridor--as high as 8,100 AADTT.

While much of the non-IS mileage in the NHS system in the corridor States has low truck volumes, certain of these highways have high volumes. An important example is U.S. 71 between Kansas City and Joplin, and U.S. 69/75 between Big Cabin (northeast of Tulsa on the I-44) and Dallas--together providing a route which bypasses much of the I-35 related toll road network through Kansas and Oklahoma.

3.8.4 Border Crossings in the Corridor

Total southbound crossings of the U.S.-Canada border averaged 14,008 trucks per day in 1995. There has been an annual truck traffic growth rate of nine percent between 1991 and 1995 along this border. The Manitoba-U.S. border accounted for 1,058 southbound movements per day in 1995. Between 1991 and 1995, this has grown at a rate of 12 percent per year.

The Pembina-Emerson crossing, located on I-29, is the highest volume crossing on the Manitoba-U.S. border and second highest on the western U.S.-Canada border, averaging a two-way total of 739 trucks per day in 1995. This is 10 percent higher than in 1994 and almost 80 percent higher than in 1992.

The U.S.-Mexico border accounted for 7,943 northbound truck movements per day in 1995. There has been a 40 percent increase in northbound truck crossings between 1990 and 1995. The Texas-Mexico border accounts for two-thirds of the total northbound truck traffic crossing the U.S.-Mexico border. Northbound truck crossings into Texas increased by nine percent per year between 1991 and 1995.

The Laredo-Nuevo Laredo crossing, located on I-35, is the highest volume crossing on the U.S.-Mexico border, averaging a northbound truck traffic of 2,010 trucks per day in 1995. Truck volumes at Laredo more than doubled from 1990 to 1995.

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4.0 Commodity and Trade Flows

This chapter is directed at understanding commodity and trade flows in the corridor, with a view to facilitating the comparing and contrasting of TS&W policy options. The extent to which certain commodities, origin-destination patterns, and routing can be affected by certain types of TS&W options varies from case to case. For example, low density, cube-out commodities are not sensitive to policy options involving weight changes, given all other things equal. This chapter presents selected characteristics about commodity and trade flows of potential relevance to the considerations of TS&W policy options. Commodity and trade flows in the study area are obtained using six data sources: (1) the Transearch Database; (2) the 1993 Commodity Flow Survey (by State of Origin); (3) Statistics Canada; (4) the Emerson Scale survey; (5) the Manitoba-based truck load carrier survey; and (6) the 1994 Transborder Surface Freight Database released by the U.S. Bureau of Transportation Statistics.

4.1 Commodity and Trade Flows Within the U.S. and the Corridor

This section discusses U.S. commodity movements.

4.1.1 Transearch Database [Ref. 1]

This section examines commodity flows in the corridor using the Reebie Transearch Database, which presents information related to truck and rail movements. [Ref. 2]. The data were analyzed for six of the nine corridor States: Minnesota, Iowa, Missouri, Kansas, Oklahoma and Texas. The Transearch Database uses 17 commodity groups for the truck mode and 23 commodity groups for rail. These commodity groups are shown in Table 4-1.

The analysis of the Transearch database required converting the data--given in annual payload ton miles, by commodity, by State origin-destination pair, by mode--into annual payload tons. This was subsequently used to calculate the number of 25-t trucks/day (by commodity, by state origin-destination pair, by mode). The 25-t measure was selected because it represents a typical maximum semitrailer truck load, based on 80,000 pounds GVW. The conversion required the use of Reebie's "U.S. State-to-State Modal Mileage Factors". An extensive discussion of the methodology and resulting detailed tables can be found in Reference 2.

Table 4-1
Commodity Groups Used in the Transearch Database

TRUCK	**RAIL**
farm (fruits and vegetables only)	farm
	forest
food (except fresh fish)	food
	ores and minerals
coal	coal
	crude petroleum and gas
textile and apparel	textile and apparel
lumber and fabricated wood	lumber and fabricated wood
furniture and fixtures	furniture and fixtures
paper and print	paper and print
chemicals	chemicals
petroleum and products	petroleum and products
plastics and rubber	plastics and rubber
glass products	glass products
building materials	building materials
primary metals	primary metals
fabricated metals	fabricated metals
machinery (except ordnance)	machinery
transport equipment	transport equipment
other	other
	waste and scrap
	shipping containers
	freight all kinds (FAK)

Source: Reference 1

For both truck and rail, the analysis considers: (1) movements within and between the corridor States; (2) movements to and from the corridor States; and (3) movements crossing through the corridor States. All figures are expressed in 25-t trucks/day (these figures can be converted to annual payload tons by multiplying by 25 tons per truck x 365 days per year). Figure 4-1 shows a graphical summary of interstate movements between the corridor States, between the corridor States and States to the east, between the corridor States and States to the west, across the corridor States. The figure illustrates that movements to and from the corridor States, particularly to and from the east, and across the corridor States, are much larger than interstate movements between the corridor States.

A. Movements within the Corridor

Table 4-2 shows the quantity of 1994 freight movements by State origin-destination pairs within the corridor. The table shows the total quantity of freight movement by truck and rail mode share within and between pairs of corridor States.

Table 4-2
Total Freight Movement and Rail Mode Share in the Corridor States
(given in 25-t Trucks/Day--rail mode share--as percentage--shown in brackets)

Origin State	Destination State											
	IA		KS		MN		MO		OK		TX	
IA	3877	(44%)	186	(6%)	776	(14%)	820	(30%)	100	(46%)	281	(74%)
KS	191	(15%)	1882	(20%)	148	(3%)	1164	(16%)	633	(74%)	1006	(91%)
MN	419	(39%)	42	(19%)	4562	(34%)	208	(69%)	21	(52%)	171	(69%)
MO	315	(50%)	313	(16%)	75	(43%)	3161	(10%)	255	(58%)	498	(61%)
OK	115	(23%)	312	(43%)	62	(10%)	281	(20%)	2138	(8%)	1253	(55%)
TX	145	(52%)	301	(27%)	170	(28%)	339	(41%)	950	(18%)	17553	(23%)
TOTAL	5062		3036		5793		5973		4097		20762	

Source: Reference 2

Of the total 44,723 25-t trucks/day of movement: [Ref. 2]

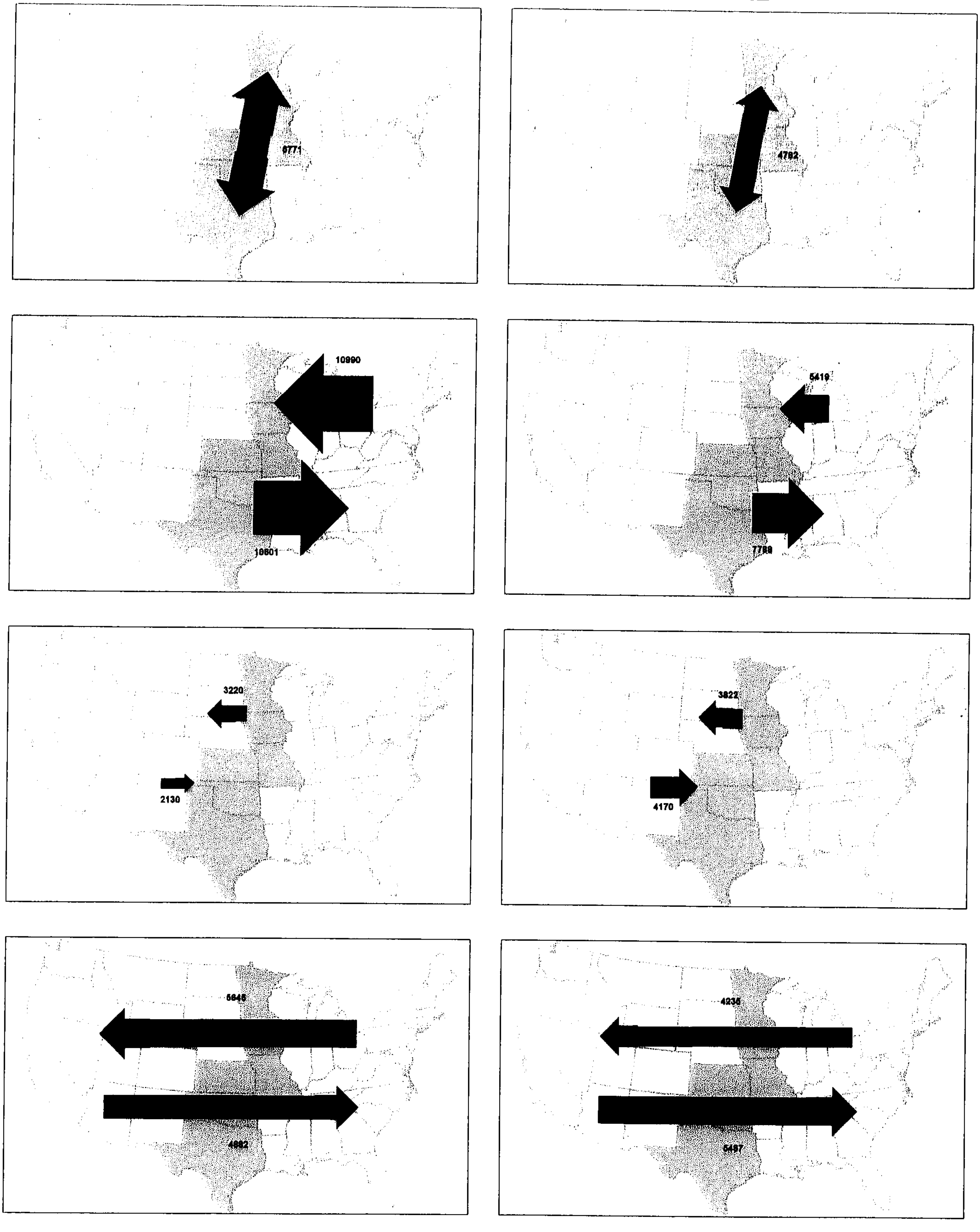
- Truck accounts for 71.2 percent (31,826 25-t trucks/day)--about four-fifths intrastate and one-fifth interstate.

Figure 4-1

Interstate Commodity Movements Involving the Corridor States by Truck and Rail

(figures shown are in 25-t Trucks/Day)

TRUCK **RAIL**



- Rail accounts for 28.8 percent (12,900 25-t trucks/day)--about two-thirds intrastate and one-third interstate.

Of the total 11,553 25-t trucks/day of interstate movement between the corridor States: [Ref. 2]

- Truck accounts for 58.6 percent (6,771 25-t trucks/day)--with about 2 tons southbound through the corridor for every 3 tons northbound.

- Rail accounts for 41.4 percent (4,782 25-t trucks/day)--with about 3 tons southbound through the corridor for every 1 ton northbound.

For both truck and rail, a few commodities account for the major share of total tonnage hauled within the corridor States. Table 4-3-a shows the commodities accounting for more than 80 percent of the total intrastate movement and 80 percent of the total interstate movement by truck. Intrastate movements total 25,055 25-t trucks/day and interstate movements total 6,771 25-t trucks /day.

Table 4-3-a

Major Commodities Moved by Truck within the Corridor

(Number of 25-t Trucks/Day)

INTRASTATE MOVEMENTS (25,055)		INTERSTATE MOVEMENTS (6,771)	
building materials	10,920 (43.6%)	food (except fresh fish)	2,105 (31.1%)
food (except fresh fish)	5,475 (21.9%)	petroleum and products	1,317 (19.5%)
petroleum and products	2,078 (8.3%)	building materials	1,219 (18.0%)
chemicals	2,023 (8.1%)	chemicals	882 (13.0%)

Source: Reference 2

Table 4-3-b shows the commodities accounting for more than 80 percent of the total intrastate movement and 80 percent of the total interstate movement by rail. Intrastate movements total 8,118 25-t trucks/day and interstate movements total 4,782 25-t trucks/day.

Table 4-3-b

Major Commodities Moved by Rail within the Corridor

(Number of 25-t Trucks/Day)

INTRASTATE MOVEMENTS (8,118)		INTERSTATE MOVEMENTS (4,782)	
ores and minerals	3,005 (37.0%)	farm	1,656 (34.6%)
farm	2,213 (27.3%)	food	770 (16.1%)
chemicals	832 (10.2%)	coal	574 (12.0%)
food	566 (7.0%)	chemicals	571 (11.9%)
		ores and minerals	323 (6.8%)

Source: Reference 3

For both truck and rail, a number of commodities account for a very low proportion of total tonnage. Five are common to both; others are unique to each mode. Commodities accounting for less than one percent of the total of truck movements and less than one percent of the total of rail movements within the corridor States are shown in Table 4-4.

Table 4-4

Minor Commodities Moved in the Corridor States

TRUCK	RAIL
textile and apparel	textile and apparel
furniture and fixtures	furniture and fixtures
plastic and rubber	plastic and rubber
glass products	glass products
other	other
transport equipment	forest
farm (fruits and vegetables only)	crude petroleum and gas
	lumber and fabricated wood
	fabricated metals
	machinery
	shipping containers
	FAK

Source: Reference 3

Table F-1 in Appendix F shows those commodities which move between the same State origin-destination pairs, in the same direction, in "major quantities", by both truck and rail. For the purposes here, a major quantity movement is defined as 10 or more 25-t trucks/day.

Of the 30 interstate origin-destination movements in this corridor:

- 13 have major movements of food (66.7% by truck-33.3% by rail)
- 13 have major movements of chemicals (63.0% by truck-37.0% by rail)
- 5 have major movements of pet and products (84.2% by truck-15.8% by rail)
- 4 have major movements of building materials (79.9% by truck-20.1% by rail)
- 3 have major movements of primary metals (52.0% by truck-48.0% by rail)
- 1 has a major movement of coal (39.3% by truck-60.7% by rail)
- 1 has a major movement of paper and print (29.2% by truck-70.8% by rail)

No other commodity is moved in major quantities by both modes between State pairs within the corridor. Some observations and comments regarding these commodity movements are: [Ref. 2]

- A few commodities dominate the total tonnage hauled by truck and rail, both intra and interstate, within the corridor States. The effects of TS&W policy options on mode diversion and truck-to-truck diversion relating to these commodities will dominate the "weight-related" impacts of these policy options.

- Two of the dominant commodity groups--food and chemicals--are dominant in both intra and interstate movements. Building materials is a dominant commodity for both modes intrastate within the corridor. Food, chemicals and building materials are important "weight" commodities for both modes throughout the corridor States. The potential effects of TS&W policy options on mode diversion relating to these commodities will dominate the "mode share" related impacts of these policy options.

- Between corridor States, about one-quarter of the rail tonnage and 40 percent of the truck tonnage are common commodities, moving in major quantities (more than 10 25-t trucks/day), between the same State pairs, in the same direction. The potential effects of TS&W policy options on mode share for these commodities and interstate origin-destination movements are particularly important.

B. Movements to and from the Corridor [Ref. 2]

This section presents a summary of the results obtained regarding movements to and from the corridor States from and to other States.

There are 49,230 25-t trucks/day of movement between the corridor States and other States. This represents more than four times the interstate movements between the corridor States themselves. Nearly three-quarters of this movement is to and from east of the corridor States, and about one-third is to and from west of the corridor States.

Trucking between the corridor States and the west

Trucking accounts for 37 percent of the movement to and from the west. More than half of this west-oriented trucking is between corridor States and the west adjacent States of North Dakota, South Dakota, Nebraska, Colorado and New Mexico. California accounts for another nearly one-quarter of this west-oriented trucking. Other particularly important western States trading by truck with the corridor States are Arizona, Washington and Idaho. Major commodities moved by truck from the west into the corridor States are food, farm products and building materials. Major commodities moved by truck to the west from the corridor States are food, petroleum and products, and chemicals.

Trucking between the corridor States and the east

Trucking accounts for nearly two-thirds of the movement to and from the east. Nearly half of this east-oriented trucking is between corridor States and the east adjacent States of Illinois, Louisiana, Arkansas and Wisconsin. Other particularly important eastern States trading by truck with the corridor States are Indiana, Ohio and Michigan. Major commodities moved by truck from the east into the corridor States are food, chemicals and paper. Major commodities moved by truck to the east from the corridor States are food, chemicals and petroleum and products.

Rail between the corridor States and the west

Rail accounts for about two-thirds of the movement to and from the west. Almost half of this west-oriented rail movement is between corridor States and the west adjacent States of North Dakota, South Dakota,,Nebraska, Colorado and New Mexico. California accounts for more than one-quarter of this west-oriented movement. Other particularly important western States trading by rail with the corridor States are Montana, Washington, Utah and Wyoming. Major commodities moved by rail from the west into the corridor States are coal, farm products and FAK. Major commodities moved by rail to the west from the corridor States are chemicals, food and FAK.

Rail between the corridor States and the east

Rail accounts for more than one-third of the movement to and from the east. More than half of this east-oriented rail movement is between corridor States and the east adjacent States of Illinois, Louisiana, Arkansas and Wisconsin. Other particularly important eastern States trading by rail with the corridor States are Tennessee, Georgia and Ohio. Major commodities moved by rail from the east into the corridor States are chemicals, transport equipment and paper and print. Major commodities moved by rail to the east from the corridor States are chemicals, food and farm products.

C. **Movements Across the Corridor** [Ref. 2]

This section presents a summary of movements across the corridor States between western and eastern States.

There are 20,250 25-t trucks/day (excluding all coal moving eastbound by rail) of movement crossing the corridor States between States to the west and States to the east--nearly twice as much that moves interstate between the corridor States themselves.

More than one-third of the cross-corridor movement is between California and States to the east of the corridor. Trucking accounts for nearly one-half of the California-associated cross-corridor movement. The directional split for the California traffic is two tons eastbound for every three tons westbound.

Nearly one-third of the cross-corridor movement is between Illinois and States to the west of the corridor. Trucking accounts for 28.60 percent of the Illinois-associated cross-corridor movement. The directional split for the Illinois traffic is about three tons eastbound for about two tons westbound. One-half of the total cross-corridor movement is made by truck and nearly one-half of the total cross-corridor movement is made by rail.

D. Competitive Interstate Movements Relating to the Corridor [Ref. 2]

Table 4-5 shows the eleven commodity groups that are identified as being competitive in the corridor. This table also shows the number of times a given corridor State is an origin or destination of a given competitive commodity movement.

Table 4-5
Competitive Commodity Groups in the Mid-Continent Corridor

Commodity Group	No. of competitive O-D State pairs involving a corridor State	No. of times a given State is an origin or destination for competitive movements					
		MN	IA	MO	KS	OK	TX
food	52	9	11	14	8	4	19
chemicals	44	5	7	7	6	4	28
building materials	13	1	2	7	0	2	5
primary metals	12	1	2	2	0	1	9
petroleum and products	12	2	1	1	1	3	9
paper and print	10	2	1	0	0	1	7
lumber and fab wood	9	3	0	1	0	1	4
farm	4	1	0	0	0	0	3
transport equipment	3	0	0	2	0	0	1
coal	2	0	0	2	1	0	0
machinery	1	0	0	0	0	0	1
TOTAL	162	24	24	36	16	16	86

Source: Reference 2

To assist with the above table, "food" is a commodity group which moves by both modes in quantities of at least ten 25-t trucks per day between 52 origin-destination State pairs associated with the corridor States, where an origin-destination pair is directional--Minnesota to Illinois, for example--with at least one State being in the corridor. Nineteen of these competitive origin-destination pairs involve either an origin or destination in Texas.

Table 4-5 indicates that from the standpoint of the consideration of TS&W policy options on truck-rail diversion: (1) Each of the six corridor States has potentially important truck-rail diversion opportunities; and (2) Interstate movements to and from corridor States involving food and chemicals are particularly important.

4.1.2 Commodity Flow Survey [Ref. 2]

This section presents commodity flow information obtained from the 1993 Commodity Flow Survey (CFS) for the Mid-continent corridor States. Data for this section were available for all nine corridor States.

A. Tonnage by Mode

The mode of transportation used for tonnage originating in each State is shown in Table 4-6. For the nine corridor States combined:

- Trucking handles about 60 percent of the originating tonnage--mainly in private (54.39 percent) versus for-hire (45.61 percent) trucks. Variations from this general are: (1) the truck mode share is less in North Dakota (about one-third), it is less in Texas (about one-half), and it is more in South Dakota and Missouri (about 80 percent each); and (2) for-hire trucks dominate private trucks in Kansas.
- Rail handles about one-sixth (16.2 percent) of the originating tonnage.
- About 1 of 500 tons (0.21 percent) originating in these nine States is moved intermodally--principally by truck and rail.

Table 4-6
1993 Tonnage by Mode by State of Origin
(data shows number of tons in thousands)

Mode of transportation	North Dakota	South Dakota	Nebraska	Minnesota	Iowa	Missouri	Kansas	Oklahoma	Texas	Total
All modes	**60,768**	**25,160**	**97,992**	**189,909**	**164,544**	**195,212**	**134,545**	**119,595**	**882,021**	**1,869,746**
SINGLE MODES										
Parcel, U.S. Postal Service, or courier	36	55	149	817	230	640	202	118	942	3,189
Private truck	8,716	12,075	37,683	61,488	76,163	96,128	40,479	42,148	234,023	608,903
For-hire truck	8,699	7,939	26,561	52,550	46,355	58,948	55,617	33,912	220,128	510,709
Air	-	(D)	-	-	-	1	(S)	-	3	4
Rail	21,697	3,658	30,213	38,084	25,723	11,827	27,749	13,880	130,663	303,494
Inland water	-	-	(D)	(S)	(S)	20,531	-	(D)	36,396	56,927
Great Lakes	-	-	-	(S)	-	-	-	-	-	-
Deep sea water	-	-	-	-	-	-	-	-	-	-
Pipeline	(D)	-	-	3,540	(D)	-	5,237	11,437	168,049	188,263
MULTIPLE MODES										
Private truck and for-hire truck	(S)	(S)	(S)	94	(S)	(S)	(D)	(S)	1,292	1,386
Truck and air	-	2	5	(S)	11	58	12	14	(S)	102
Truck and rail	(D)	189	156	485	220	948	388	(S)	1,542	3,928
Truck and water	-	(D)	(D)	(S)	(S)	(S)	(S)	(S)	8,830	8,830
Truck and pipeline	-	-	-	-	(D)	(D)	-	-	(S)	-
Rail and water	(D)	-	-	(S)	-	-	(D)	(D)	-	-
Inland water and Great Lakes	-	-	-	(D)	-	-	-	-	(S)	-
Inland water and deep sea	-	-	-	(D)	-	(D)	-	(D)	26,515	26,515
OTHER MODES										
Other and unknown modes	18,356	1,191	806	8,213	4,480	5,099	2,406	14,391	46,951	101,893

- Represents zero or less than 1 unit of measure.
(D) Denotes figures withheld to avoid disclosing data for individual companies.
(S) Data do not meet publication standards due to high sampling variability or other reasons. Some unpublished estimates can be derived by subtracting published data from their respective totals. However, the figures obtained by such subtraction are subject to these same limitations.

Source: Individual State CFS Reports

B. Distance Shipped by Mode

The distance shipped by mode of tonnage originating in each State is shown in Table 4-7. For the nine corridor States combined:

- Short haul shipping distances (less than 250 miles) account for nearly 9 of 10 of all tons moved by truck (95.4 percent for the tonnage moved by private trucks; 79.1 percent for the tonnage moved by for-hire trucks). The dominance of trucking in the short haul distance market is very consistent for eight of the nine States--86.2 percent in South Dakota, 85.1 percent for Nebraska, 87.1 percent for Minnesota, 87.6 percent in Iowa, 87.7 percent in Missouri, 86.7 percent in Kansas, 87.9 percent in Oklahoma, 89.7 percent in Texas. In North Dakota it is 70.1 percent.

- Long haul shipping distances (250 miles and more) account for nearly 6 of 10 (55.6 percent) of all tons moved by rail.

- The quantity of tonnage moved by rail long haul shipping distances is more than the quantity moved by truck (127,645 tons by truck; 168,702 tons by rail).

C. Tonnage by Commodity

The commodity tonnages originating in each State are shown in Table 4-8.

- Six commodities account for about 85 percent of all tons originating in the nine States combined. These commodities are: nonmetallic minerals, farm products, food or kindred products, petroleum or coal products, clay-concrete-glass-or stone products, and chemicals or allied products. These same commodities also account for more than 60 percent of all tonnage in most of the nine States--58.3 percent in North Dakota, 85.7 percent in South Dakota, 90.2 percent in Nebraska, 64.6 percent in Minnesota, 92.0 percent in Iowa, 85.7 percent in Missouri, 93.0 percent in Kansas, 88.7 percent in Oklahoma, and 83.9 percent in Texas.

D. Tonnage by Destination States

Table 4-9 shows the CFS tonnages moved from the nine corridor States to all other corridor States. Also shown are the intra-State movements.

Table 4-7

1993 Distance Shipped by Mode by State of Origin

(Data shows number of tons in thousands)

Mode of transportation	North Dakota Number	North Dakota Percent	South Dakota Number	South Dakota Percent	Nebraska Number	Nebraska Percent	Minnesota Number	Minnesota Percent	Iowa Number	Iowa Percent	Missouri Number	Missouri Percent	Kansas Number	Kansas Percent	Oklahoma Number	Oklahoma Percent	Texas Number	Texas Percent	Total Number	Total Percent
Private truck	8,716	100.0	12,075	100.0	37,683	100.0	61,488	100.0	76,163	100.0	96,128	100.0	40,479	100.0	42,148	100.0	234,023	100.0	608,903	100.0
Less than 50 miles	5,461	62.7	8,042	66.6	30,323	80.5	48,234	78.4	55,660	73.1	77,794	80.9	27,950	69.0	27,707	65.7	171,966	73.5	453,137	74.4
50 to 99 miles	1,182	13.6	1,305	10.8	2,638	7.0	6,377	10.4	10,633	14.0	7,977	8.3	4,804	11.9	7,277	17.3	27,621	11.8	69,814	11.5
100 to249 miles	1,461	16.8	2,145	17.8	2,550	6.8	4,702	7.6	5,971	7.8	7,286	7.6	5,294	13.1	5,391	12.8	23,209	9.9	58,009	9.5
250 to 499 miles	(S)	(S)	262	2.2	919	2.4	1,316	2.1	1,194	1.6	1,799	1.9	1,572	3.9	987	2.3	7,043	3.0	15,092	2.5
500 to 749 miles	45	0.5	192	1.6	(S)	(S)	322	0.5	291	0.4	795	0.8	469	1.2	288	0.7	1,386	0.6	3,788	0.6
750 to 999 miles	31	0.4	68	0.6	84	0.2	199	0.3	(S)	(S)	252	0.3	140	0.3	213	0.5	(S)	(S)	987	0.2
1,000 to 1,499 miles	(S)	(S)	59	0.5	296	0.8	321	0.5	194	0.3	172	0.2	249	0.6	260	0.6	699	0.3	2,250	0.4
1,500 to 1,999 miles	(S)	(S)	(S)	(S)	(S)	(S)	18	0.0	(S)	(S)	54	0.1	(S)	(S)	26	0.1	126	0.1	224	0.0
2,000 miles or more	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
For-hire truck	8,699	100.0	7,939	100.0	26,561	100.0	52,550	100.0	46,355	100.0	58,948	100.0	55,617	100.0	33,912	100.0	220,128	100.0	510,709	100.0
Less than 50 miles	2,096	24.1	2,857	36.0	11,144	42.0	21,049	40.1	15,078	32.5	29,067	49.3	23,945	43.1	11,801	34.8	147,771	67.1	264,808	51.9
50 to 99 miles	(S)	(S)	1,355	17.1	2,973	11.2	8,048	15.3	9,760	21.1	5,017	8.5	10,925	19.6	6,287	18.5	14,655	6.7	59,020	11.6
100 to249 miles	2,009	23.1	1,532	19.3	5,075	19.1	10,923	20.8	10,357	22.3	8,844	15.0	10,342	18.6	8,459	24.9	22,092	10.0	79,633	15.6
250 to 499 miles	2,236	25.7	1,170	14.7	3,027	11.4	5,543	10.5	5,150	11.1	8,138	13.8	4,529	8.1	3,755	11.1	13,468	6.1	47,016	9.2
500 to 749 miles	(S)	(S)	333	4.2	1,513	5.7	2,298	4.4	2,362	5.1	3,885	6.6	2,687	4.8	1,692	5.0	6,849	3.1	21,619	4.2
750 to 999 miles	163	1.9	291	3.7	1,098	4.1	2,288	4.4	1,686	3.6	2,095	3.6	1,070	1.9	888	2.6	6,718	3.1	16,297	3.2
1,000 to 1,499 miles	299	3.4	364	4.6	1,714	6.5	1,988	3.8	1,427	3.1	1,327	2.3	2,080	3.7	973	2.9	7,050	3.2	17,222	3.4
1,500 to 1,999 miles	7	0.1	37	0.5	17	0.1	410	0.8	534	1.2	559	0.9	38	0.1	57	0.2	1,506	0.7	3,165	0.6
2,000 miles or more	-	-	(S)	(S)	-	-	3	0.0	-	-	(S)	(S)	-	-	(S)	(S)	19	0.0	22	0.0
Private & For-hire truck	17,415	100.0	20,014	100.0	64,244	100.0	114,038	100.0	122,518	100.0	155,076	100.0	96,096	100.0	76,060	100.0	454,151	100.0	1,119,612	100.0
Less than 50 miles	7,557	43.4	10,899	54.5	41,467	64.5	69,283	60.8	70,738	57.7	106,861	68.9	51,895	54.0	39,508	51.9	319,737	70.4	717,945	64.1
50 to 99 miles	1,182	6.8	2,660	13.3	5,611	8.7	14,425	12.6	20,393	16.6	12,994	8.4	15,729	16.4	13,564	17.8	42,276	9.3	128,834	11.5
100 to249 miles	3,470	19.9	3,677	18.4	7,625	11.9	15,625	13.7	16,328	13.3	16,130	10.4	15,636	16.3	13,850	18.2	45,301	10.0	137,642	12.3
250 to 499 miles	2,236	12.8	1,432	7.2	3,946	6.1	6,859	6.0	6,344	5.2	9,937	6.4	6,101	6.3	4,742	6.2	20,511	4.5	62,108	5.5
500 to 749 miles	45	0.3	525	2.6	1,513	2.4	2,620	2.3	2,653	2.2	4,680	3.0	3,156	3.3	1,980	2.6	8,235	1.8	25,407	2.3
750 to 999 miles	194	1.1	359	1.8	1,182	1.8	2,487	2.2	1,686	1.4	2,347	1.5	1,210	1.3	1,101	1.4	6,718	1.5	17,284	1.5
1,000 to 1,499 miles	299	1.7	423	2.1	2,010	3.1	2,309	2.0	1,621	1.3	1,499	1.0	2,329	2.4	1,233	1.6	7,749	1.7	19,472	1.7
1,500 to 1,999 miles	7	0.0	(S)	(S)	17	0.0	428	0.4	534	0.4	613	0.4	38	0.0	83	0.1	1,632	0.4	3,352	0.3
2,000 miles or more	-	-	(S)	(S)	-	-	3	0.0	-	-	-	-	-	-	-	-	19	0.0	22	0.0
Rail	21,697	100.0	3,658	100.0	30,213	100.0	38,084	100.0	25,723	100.0	11,827	100.0	27,749	100.0	13,880	100.0	130,663	100.0	303,494	100.0
Less than 50 miles	(S)	(S)	(D)	(D)	414	1.4	(S)	(S)	931	3.6	1,247	10.5	1,085	3.9	288	2.1	52,269	40.0	56,234	18.5
50 to 99 miles	3,481	16.0	(S)	(S)	(S)	(S)	(S)	(S)	1,467	5.7	836	7.1	871	3.1	(S)	(S)	6,062	4.6	12,717	4.2
100 to249 miles	(S)	(S)	515	14.1	(S)	(S)	4,573	12.0	8,822	34.3	1,720	14.5	5,179	18.7	2,441	17.6	18,460	14.1	41,710	13.7
250 to 499 miles	7,862	36.2	1,637	44.7	6,450	21.3	3,504	9.2	6,834	26.6	3,044	25.7	6,175	22.3	4,436	32.0	8,983	6.9	48,925	16.1
500 to 749 miles	2,092	9.6	(D)	(D)	1,793	5.9	5,718	15.0	1,940	7.5	2,457	20.8	9,287	33.5	3,371	24.3	15,198	11.6	41,856	13.8
750 to 999 miles	(S)	(S)	565	15.4	5,203	17.2	1,985	5.2	2,562	10.0	1,372	11.6	3,021	10.9	886	6.4	14,422	11.0	30,016	9.9
1,000 to 1,499 miles	3,747	17.3	325	8.9	13,528	44.8	8,033	21.1	2,010	7.8	779	6.6	2,112	7.6	406	2.9	11,704	9.0	42,644	14.1
1,500 to 1,999 miles	(S)	(S)	(S)	(S)	-	-	248	0.7	1,157	4.5	373	3.2	(S)	(S)	34	0.2	3,449	2.6	5,261	1.7
2,000 miles or more	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(S)	(S)	-	-

- Represents zero or less than 1 unit of measure.

(D) Denotes figures withheld to avoid disclosing data for individual companies.

(S) Data do not meet publication standards due to high sampling variability or other reasons. Some unpublished estimates can be derived by subtracting published data from their respective totals. However, the figures obtained by such subtraction are subject to these same limitatons.

Source: Individual CFS Reports

Table 4-8

1993 Commodity Handlings by Mode by State of Origin

(Data shows number of tons in thousands)

Commodity description	North Dakota		South Dakota		Nebraska		Minnesota		Iowa		Missouri		Kansas		Oklahoma		Texas		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
ALL COMMODITIES																				
Total	**60,768**	**100.0**	**25,160**	**100.0**	**97,992**	**100.0**	**189,909**	**100.0**	**164,544**	**100.0**	**195,212**	**100.0**	**134,545**	**100.0**	**119,595**	**100.0**	**882,021**	**100.0**	**1,869,746**	**100.0**
Farm products	19,154	31.5	7,322	29.1	44,887	45.8	39,272	20.7	54,394	33.1	23,450	12.0	33,711	25.1	11,381	9.5	49,157	5.6	282,728	15.1
Forest products	-	-	(D)	(D)	-	-	(D)	(D)	13	0.0	(D)	(D)	(D)	(D)	(S)	(S)	(S)	(S)	13	0.0
Fresh fish or other marine products	-	-	-	-	(S)	(S)	19	0.0	(S)	(S)	(S)	(S)	(D)	(D)	(S)	(S)	73	0.0	92	0.0
Metallic ores	(D)	(D)	-	-	(D)	(D)	35,881	18.9	(S)	(S)	1,057	0.5	(D)	(D)	(D)	(D)	1,662	0.2	38,600	2.1
Coal	(D)	(D)	-	-	-	-	(D)	(D)	-	-	(D)	(D)	753	0.6	1,428	1.2	33,357	3.8	35,538	1.9
Crude petroleum, natural gas, or gasoline	(S)	(S)	(D)	(D)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	-	
Nonmetallic minerals	2,016	3.3	5,650	22.5	13,678	14.0	24,123	12.7	24,846	15.1	60,682	31.1	25,963	19.3	25,605	21.4	92,873	10.5	275,436	14.7
Ordnance or accessories	(D)	(D)	(S)	(S)	3	0.0	(S)	(S)	(S)	(S)	26	0.0	(D)	(D)	(S)	(S)	24	0.0	53	0.0
Food or kindred products	3,980	6.5	3,058	12.2	17,090	17.4	31,804	16.7	39,780	24.2	27,374	14.0	19,504	14.5	8,945	7.5	51,979	5.9	203,514	10.9
Tobacco products, excluding insecticides	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	65	0.0	(S)	(S)	11	0.0	(S)	(S)	76	0.0
Textile mill products	9	0.0	3	0.0	16	0.0	109	0.1	22	0.0	93	0.0	26	0.0	68	0.1	475	0.1	821	0.0
Apparel or other finished textile products	5	0.0	8	0.0	67	0.1	70	0.0	82	0.0	131	0.1	44	0.0	66	0.1	826	0.1	1,299	0.1
Lumber or wood products, excluding furniture	305	0.5	1,106	4.4	581	0.6	6,757	3.6	1,562	0.9	4,413	2.3	484	0.4	1,705	1.4	17,605	2.0	34,518	1.8
Furniture or fixtures	(S)		(S)	(S)	(S)	(S)	268	0.1	203	0.1	632	0.3	45	0.0	58	0.0	900	0.1	12,318	0.7
Pulp, paper, or allied products	67	0.1	115	0.5	533	0.5	5,471	2.9	1,418	0.9	3,711	1.9	994	0.7	2,423	2.0	8,407	1.0	23,139	1.2
Printed matter	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	-	-
Chemicals or allied products	684	1.1	(S)	(S)	4,082	4.2	5,209	2.7	7,265	4.4	6,979	3.6	7,224	5.4	8,023	6.7	96,505	10.9	135,971	7.3
Petroleum or coal products	8,352	13.7	1,797	7.1	3,477	3.5	14,198	7.5	9,632	5.9	12,226	6.3	29,727	22.1	39,469	33.0	385,848	43.7	504,726	27.0
Rubber or miscellaneous plastics products	62	0.1	68	0.3	248	0.3	1,007	0.5	659	0.4	1,158	0.6	1,064	0.8	846	0.7	3,004	0.3	8,116	0.4
Leather or leather products	-	-	-	-	(S)	(S)	35	0.0	(S)	(S)	130	0.1	(S)	(S)	1	0.0	50	0.0	216	0.0
Clay, concrete, glass, or stone products	1,362	2.2	3,720	14.8	9,261	9.5	13,368	7.0	15,240	9.3	36,574	18.7	8,842	6.6	12,692	10.6	64,398	7.3	165,457	8.8
Primary metal products	51	0.1	75	0.3	1,063	1.1	2,380	1.3	2,077	1.3	4,826	2.5	696	0.5	2,164	1.8	15,945	1.8	29,277	1.6
Fabricated metal products	78	0.1	123	0.5	842	0.9	1,262	0.7	1,437	0.9	1,757	0.9	529	0.4	783	0.7	4,981	0.6	11,792	0.6
Machinery, excluding electrical	197	0.3	191	0.8	519	0.5	1,076	0.6	1,062	0.6	805	0.4	471	0.4	439	0.4	2,763	0.3	7,523	0.4
Electrical machinery, equipment, or supplies	18	0.0	30	0.1	180	0.2	521	0.3	568	0.3	1,225	0.6	804	0.6	203	0.2	1,344	0.2	4,893	0.3
Transportation equipment	(S)	(S)	55	0.2	322	0.3	830	0.4	795	0.5	2,509	1.3	398	0.3	1,025	0.9	1,934	0.2	7,868	0.4
Instruments, photographic goods, optical goods, watches, or clocks	8	0.0	(S)	(S)	137	0.1	106	0.1	39	0.0	146	0.1	32	0.0	33	0.0	539	0.1	1,040	0.1
Miscellaneous products of manufacturing	6	0.0	22	0.1	84	0.1	770	0.4	135	0.1	382	0.2	171	0.1	202	0.2	(S)	(S)	1,772	0.1
Waste or scrap materials	173	0.3	158	0.6	343	0.4	2,985	1.6	(D)	(D)	2,079	1.1	1,027	0.8	563	0.5	7,985	0.9	15,313	0.8
Miscellaneous freight shipments	-	-	2	0.0	(D)	(D)	13	0.0	688	0.4	(S)	(S)	235	0.2	15	0.0	2,610	0.3	3,563	0.2
Containers, carriers or devices, shipping, returned empty	(D)	(D)	-	-	(S)	(S)	-	-	7	0.0	1	0.0	-	-	(S)	(S)	23	0.0	31	0.0
Waste hazardous materials or waste hazardous substances	(S)	(S)	-	-	-	-	8	0.0	(D)	(D)	(D)	(D)	23	0.0	(D)	(D)	(S)	(S)	31	0.0
Commodity unknown	(S)	(S)	(S)	(S)	(S)	(S)	42	0.0	78	0.0	61	0.0	101	0.1	228	0.2	1,206	0.1	1,716	0.1

- Represents zero or less than 1 unit of measure.
(D) Denotes figures withheld to avoid disclosing data for individual companies.
(S) Data do not meet publication standards due to high sampling variability or other reasons. Some unpublished estimates can be derived by subtracting published data from their respective totals. However, the figures obtained by such subtraction are subject to these same limitatons.

Source: Individual State CFS Reports

Table 4-9

1993 Tonnage by State of Destination for State of Origin

(data shows number of tons in thousands)

	North Dakota	South Dakota	Nebraska	Minnesota	Iowa	Missouri	Kansas	Oklahoma	Texas
Total in State	**34,118**	**13,873**	**48,004**	**111,491**	**99,410**	**123,717**	**72,336**	**65,612**	**737,868**
To									
North Dakota		638	(S)	2,183	178		60		(S)
South Dakota	3,684		646	1,490	1,644		103		101
Nebraska	129	(S)		717	5,350		1,894		1,527
Minnesota	13,163	3,856	1,055		6,257	937	611	346	767
Iowa	256	1,441	4,488	3,815		2,885	1,944	507	(S)
Missouri	691	(S)	3,439	1,318	4,429		13,852	4,494	9,779
Kansas	57	28	5,073	504	1,107	8,984		6,427	3,811
Oklahoma	(S)	45	624	253	471	2,374	9,325		6,256
Texas	872	119	6,291	1,973	3,624	5,193	16,700	24,876	
Sub-Total	**18,852**	**6,127**	**21,616**	**12,253**	**15,888**	**20,373**	**42,432**	**36,650**	**22,241**
To									
Illinois	(S)	321	1,690	8,484	11,686	9,064	1,422	3,453	5,644
Other East	2,939	1,562	4,168	29,516	13,096	37,062	11,324	9,223	74,597
Sub-Total	**2,939**	**1,883**	**5,858**	**38,000**	**24,782**	**46,126**	**12,746**	**12,676**	**80,241**
To									
California	(S)	133	3,836	1,346	2,234	1,635	1,739	763	6,916
Other West	1,692	1,096	12,380	1,057	9,530	3,197	4,615	3,024	17,716
Sub-Total	**1,692**	**1,229**	**16,216**	**2,403**	**11,764**	**4,832**	**6,354**	**3,787**	**24,632**

Source: Individual State CFS Reports

Of all tonnage originating in the nine States combined:

- approximately 7 of 10 tons move intra-State
- about 15 percent moves to other corridor States
- one-eighth moves to the east
- 1 of 25 tons moves to the west

4.2 Commodity and Trade Flows Between Canada and the Corridor

TS&W regulations affect freight movement patterns and quantities. This section discusses commodity movements between Canada and the corridor in order to understand the effect of TS&W policy options on freight movements. Sources of commodity and trade flow information are: (1) Statistics Canada data; (2) results from the Emerson scale survey; (3) Manitoba-based truck load carrier survey; and (4) the Transborder Surface Freight Database.

4.2.1 Statistics Canada Data

This section presents value-related data of Manitoba trade with the U.S. The information contained in this section was obtained from Reference 4.

In 1994, Manitoba exports to the U.S. were valued at CAN$ 3.3 billion. The largest merchandise exports were to: (1) Minnesota--20.8 percent of the total; (2) North Dakota--18.6 percent of the total; (3) Pennsylvania--5.2 percent; (4) Illinois--5.0 percent; (5) Washington State--4.3 percent; (6) Texas --3.9 percent; (7) Wisconsin--3.8 percent; (8) California--3.7 percent; (9) Nebraska--2.8 percent; and (10) Michigan--2.4 percent of the total. Other States accounted for 29.6 percent of the total value-related exports.

In that same year, imports from the U.S. were valued at CAN$ 4.6 billion. The largest merchandise imports were from: (1) Illinois--14.7 percent of the total; (2) Minnesota--13.8 percent of the total; (3) Wisconsin--7.0 percent; (4) Ohio--6.8 percent; (5) Iowa--4.5 percent;

(6) Texas--3.8 percent; (7) Michigan--3.7 percent; (8) Indiana--3.6 percent; (9) California--3.6 percent; and (10) North Dakota--3.5 percent of the total. Other States accounted for 35.0 percent of the total value-related imports.

The above shows that in terms of value, most of Manitoba's activity is to and from the U.S. Mid-west, with a few movements to Texas, California, North Dakota, and Nebraska.

Table 4-10 shows exports to the U.S. and imports from the U.S. by commodity by value for 1994. The three major exports by value were: (1) motor vehicles, which accounted for 22.5 percent of total Manitoba exports to the U.S.; (2) mineral products, accounting for 18.2 percent; and (3) machinery, which accounted for 11.7 percent of Manitoba's exports to the U.S. by value. The three major imports into Manitoba were: (1) machinery, accounting for 28.8 percent of the total imports; (2) motor vehicles, which accounted for nearly one-quarter of the total; and (3) wood/pulp and paper, which accounted for 7.7 percent of Manitoba's imports from the U.S. by value.

4.2.2 Emerson Scale Survey

As discussed in Section 3.4.1, to better understand truck activity to and from Manitoba, an extensive survey was conducted at the Emerson Scale. This section discusses specific information pertaining to origin-destination and commodity movements obtained from the survey.

There were 1,167 loaded trucks traveling northbound. Of this total:

- Almost 10 percent haul machinery; 7 percent haul fresh farm products; 5 percent haul paper and paper products; 4 percent haul animal feed; another 4 percent haul lumber and fabricated wood; other types of commodities account for about 25 percent of the movements. It was not possible to determine the commodity being hauled for 40 percent of these trucks.

Table 4-10

1994 Manitoba-U.S. Trade by Major Commodity

(millions of dollars--percent of the total by direction is shown in parenthesis)

Major Commodity	Manitoba Imports from the U.S.	Manitoba Exports to the U.S.
Machinery/equipment	1,322.8 (28.8%)	387.8 (11.7%)
Motor vehicles	1,135.0 (24.7%)	745.2 (22.5%)
Wood/pulp & paper	352.6 (7.7%)	282.6 (8.5%)
Base Metals	280.9 (6.1%)	145.0 (4.4%)
Chemical products	279.0 (6.1%)	82.1 (2.5%)
Plastics/rubber	256.8 (5.6%)	78.1 (2.4%)
Processed foods	228.8 (5.0%)	239.1 (7.2%)
Textiles/hides	134.6 (2.9%)	102.9 (3.1%)
Other agricultural	100.4 (2.2%)	255.4 (7.7%)
Mineral products	93.0 (2.0%)	602.3 (18.2%)
Live animals	9.1 (0.2%)	190.4 (5.8%)
Other commodities	399.6 (8.7%)	197.8 (6.0%)
TOTAL	4,592.6 (100%)	3,308.7 (100%)

Source: Statistics Canada

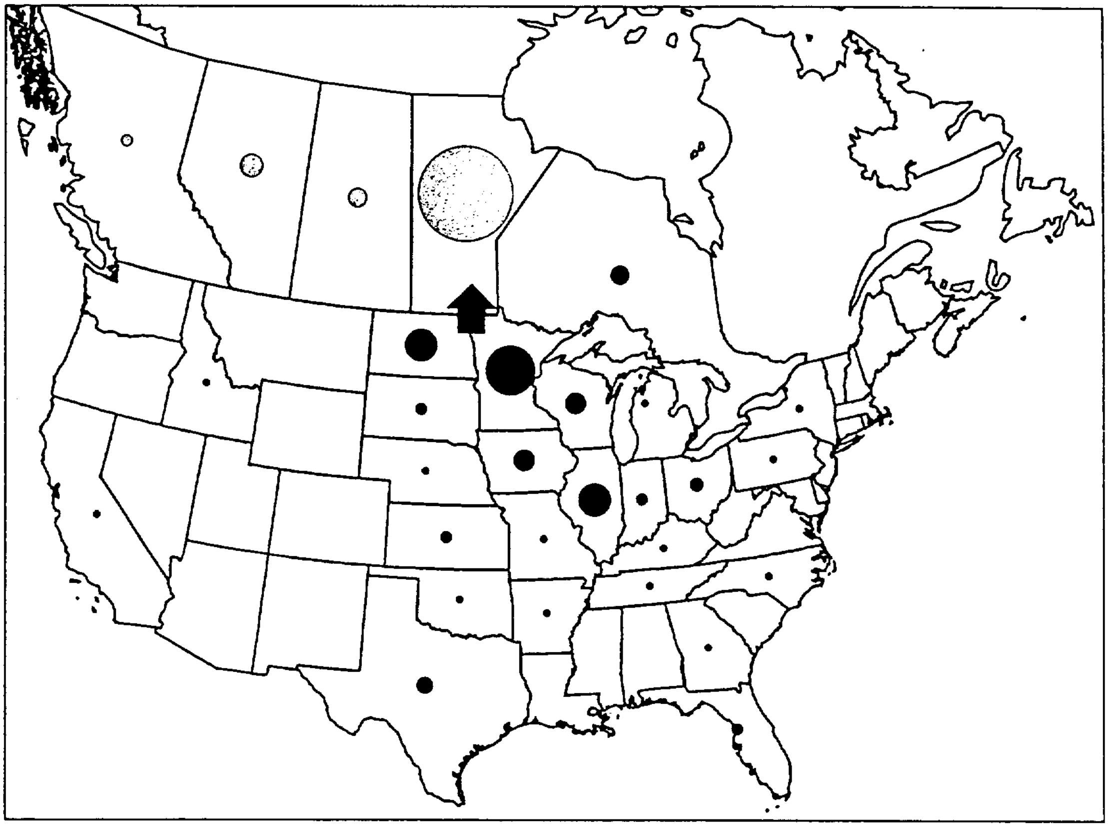
Origin-destination information was obtained for 525 (45 percent) of the 1,167 loaded trucks traveling northbound through the Emerson scale. From the 525 trucks the following was observed:

- More than one-quarter of the movements originate in Minnesota (mainly Minneapolis); 12 percent originate in North Dakota (mainly Fargo); another 12 percent originate in Illinois (mainly Chicago); 6 percent originate in both Wisconsin and Iowa. The remaining 38 percent of the movements originate in other States or Provinces. Figure 4-2-a shows the origin-destination of movements through the Emerson scale for northbound loaded trucks, for all commodities combined.

Figure 4-2-a

Origin-Destination of Northbound Loaded Trucks Through the Emerson Scale

(number shows percent of loaded trucks for which O-D was known)

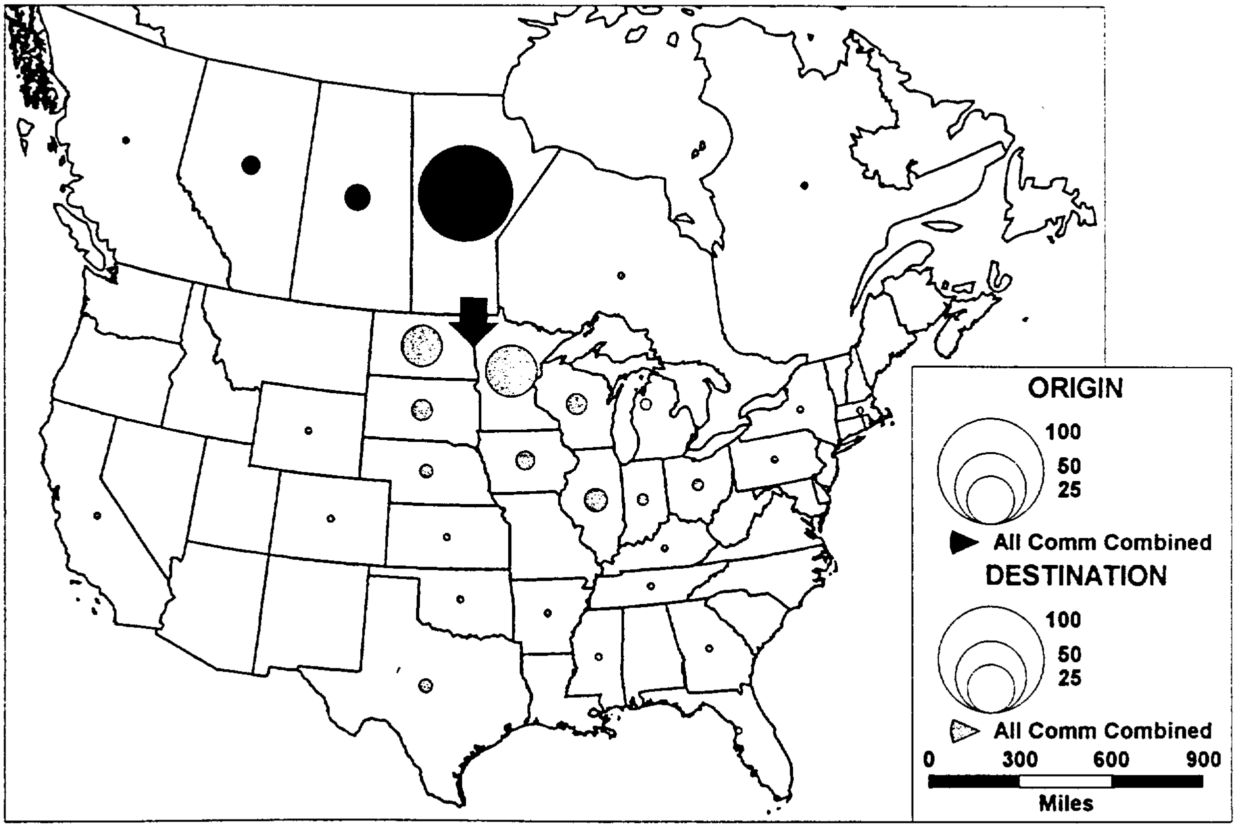


Source: Emerson Scale Survey

Figure 4-2-b

Origin-Destination of Southbound Loaded Trucks Through the Emerson Scale

(number shows percent of loaded trucks for which O-D was known)



Source: Emerson Scale Survey

- Also as illustrated in Figure 4-2-a, almost 85 percent of the movements are destined for Manitoba; 7 percent are destined for Alberta; 5 percent are destined for Saskatchewan; 2 percent for British Columbia. One percent is destined for Ontario.

Appendix D shows commodity-specific origin-destination information by direction of travel for the six major commodities traveling through the Emerson scale. The values shown in those maps represent a percentage of the trucks for which origin-destination information was known, for a specific commodity. For loaded trucks traveling in the northbound direction the following was found:

- Figure D-1-a shows that more than one-quarter of farm product movements originate in Minnesota (mainly in Minneapolis); nearly one-quarter originates in North Dakota (mainly in Fargo), and 11 percent in Texas. The remaining 39 percent of the movements originate in Ontario, California, Iowa, South Dakota, Nebraska, Florida, and other States. Ninety percent of the movements are destined for Manitoba; 6 percent are destined for Alberta; 3 percent for Saskatchewan; and one percent is destined for British Columbia.

- Figure D-2-a shows that more than one-third of lumber movements originate in Wisconsin; 12 percent in North Dakota and 12 percent in Minnesota. The remaining 41 percent of the movements originate in Missouri, Arkansas, Michigan, Florida, and other States. Almost 90 percent of the movements are destined for Manitoba; 6 percent are destined for British Columbia; and another 6 percent for Alberta.

- Figure D-3-a shows that one-third of machinery movements originate in Illinois (mainly in Chicago); 13 percent originate in Minnesota; 11 percent in Iowa; 9 percent in North Dakota and 7 percent in South Dakota. The remaining 40 percent of the movements originate in Texas, Kansas, Oklahoma, Missouri, Wisconsin, Ohio, and other States. Nearly two-thirds of the movements are destined for Manitoba; 18 percent are destined for Saskatchewan; 13 percent for Alberta; and 4 percent are destined for British Columbia.

- Figure D-4-a shows that almost one-third of paper movements originate in Wisconsin; 18 percent originate in Illinois; 18 percent in Minnesota; and 7 percent in Ontario. The remaining 26 percent of the movements originate in Montana, North Dakota, Kansas, Iowa and other States in the northeast area of the U.S. Almost 90 percent of the movements are destined for Manitoba; 7 percent are destined for Alberta; and 4 percent are destined for Saskatchewan.

- Figure D-6-a shows origin-destinations of commodities moved in hopper bottom trailers (here referred to as grain bodies). These commodities include grain, fertilizer, and animal feed. The figure shows that 60 percent of grain body movements originate in Minnesota (mainly in Minneapolis); 16 percent originate in North Dakota (mainly Fargo and Minot); 12 percent in Iowa; 5 percent in South Dakota and 3 percent in Nebraska. The remaining 4 percent of the movements originate in Arizona and Arkansas. Almost 100 percent of the movements are destined for Manitoba; one percent is destined for Saskatchewan; and another one percent for Alberta.

A total of 1,292 loaded trucks were traveling southbound. Of these:

- 10 percent haul live animals; 7 percent haul machinery; another 7 percent haul lumber and fabricated wood; 6 percent haul fresh farm products; 3 percent haul paper and paper products; other types of commodities account for about 20 percent of the movements. It was not possible to determine the commodity being hauled for 48 percent of these trucks.

Origin-destination information was obtained for 385 (30 percent) of the 1,292 loaded trucks traveling southbound through the Emerson scale. From the 385 trucks the following was observed:

- 85 percent of the movements originate in Manitoba; 9 percent originate in Saskatchewan; 6 percent originate in Alberta; and about 1 percent originate in British Columbia. This is illustrated in Figure 4-2-b.

- More than one-quarter of the movements are destined for Minnesota (mainly to Minneapolis); 16 percent are destined for North Dakota (mainly to Fargo); 6 percent are destined for each, Illinois, Wisconsin and South Dakota; 4 percent are destined for Iowa. About 38 percent of the southbound movements through the Emerson scale are destined for other States and provinces. This is shown in Figure 4-2-b.

Appendix D shows the following for southbound movements of the six major commodities that operate through the Emerson scale:

- Figure D-1-a shows that 84 percent of farm product movements originate in Manitoba; 11 percent in Alberta and 5 percent in Saskatchewan. More than one-third of the movements are destined for Minnesota (mainly Minneapolis); 21 percent are destined for North Dakota (mainly Fargo and Grand Forks); and 14 percent for Illinois (mainly Chicago). The remaining 30 percent are destined for California, Iowa and other eastern States.

- Figure D-2-b shows that almost 80 percent of lumber movements originate in Manitoba; 13 percent in Saskatchewan; and 8 percent in Alberta. One-third of the movements are destined for Minnesota; 4 percent are destined for Ontario; and 8 percent for Kansas. The remaining 55 percent are destined for North Dakota, South Dakota, Oklahoma, Texas, and other States in the Midwest.

- Figure D-3-b shows that 87 percent of machinery movements originate in Manitoba; 6 percent originate in Alberta; 3 percent in Saskatchewan; and 3 percent in Quebec. Major destinations are North Dakota (mainly Fargo)--19 percent; Minnesota (mainly Minneapolis) --13 percent; Kentucky--10 percent; California--7 percent; and Ontario--6 percent. The remaining 45 percent of the machinery movements are destined for Nebraska, Kansas, Illinois and other States in the Midwest.

- Figure D-4-b shows that 55 percent of paper movements originate in Manitoba; 35 percent originate in Saskatchewan; 7 percent in Alberta; and 3 percent in British Columbia. Major destinations are located in the U.S. Midwest. Almost one-quarter of the movements are destined for Wisconsin; 14 percent are destined for Michigan; 7 percent are destined for each Minnesota, North Dakota, South Dakota and Illinois; and 6 percent are destined for Iowa. The remaining 35 percent are destined for Indianan, New York, Ohio, and other States in the U.S. Midwest.

- Figure D-5-b shows that there are only two origins for livestock movements through Emerson. Almost 100 percent of live animal movements originate in Manitoba and 4 percent originate in Saskatchewan. The major destinations for live animal movements are: Minnesota (mainly Minneapolis)--one-third of the movements; South Dakota (mainly Soiux Falls)--29 percent; Iowa (mainly Sioux City)--11 percent; Nebraska--11 percent and North Dakota--9 percent. The remaining 7 percent of the movements are destined for Wisconsin, Kansas and Kentucky.

- Figure D-6-b shows that 80 percent of commodities moved in grain body trailers originate in Manitoba; 18 percent originate in Saskatchewan; and 2 percent in Alberta. Most of the hopper bottom movements are destined for Minnesota (principally Minneapolis)--55 percent; almost one-third are destined for North Dakota (mainly Fargo and Grand Forks); 5 percent for Iowa (mainly Soiux City); another 5 percent are destined for Wisconsin; and 3 percent are destined for Nebraska.

From the survey it is evident that other than Maniotba, most of the movements either originate or end in the U.S. Midwest. Major trading States are North Dakota, South Dakota, Minnesota, Illinois, Wisconsin and Iowa.

4.2.3 Manitoba-based Truck Load Carrier Survey

As discussed in Section 3.4.2, nine of the major Manitoba-based truck load carriers were interviewed in October, 1996 to get information regarding origin-destinations, commodities hauled, equipment used, method of operation, intermodal operations, activity levels, and other information regarding trucking between Manitoba and the U.S. This section discusses the results obtained regarding origin-destinations, commodity movements and routing.

All the carriers surveyed specialize in truckload movements from Canada to the U.S. and across Canada. The quantity of movements across Canada is not as high as the quantity of movements across the Manitoba-U.S. border. Some carriers think that the reason for this is that "there is no money east-west" or that "there are many good opportunities for the companies in eastern U.S."

For eight of the nine carriers interviewed, more than one-half of their operations either originate or end in the U.S. The major destinations of these carriers are the U.S. Midwest, northeast, and the Great Lake Region (mainly Minnesota, Iowa, Illinois, Wisconsin, Indiana, Michigan, New York, Ohio, Kentucky, Iowa, Georgia, and Tennessee).

Eight of the nine carriers also have operations that are destined for places south of Kansas City. However, these are minor in terms of quantity of shipments. One of the carriers mentioned that one of the reasons why they have very few movements to places south of Kansas City is that the southern market is completely dominated by U.S. carriers such as Schneider and J.B. Hunt. Of the eight carriers that operate south of Kansas City, four have the U.S.-Mexico border as the major destination/origin. Loads are taken from Manitoba or

Toronto to: (1) Texas--to Laredo, El Paso, and McAllen; (2) Arizona--to Nogales (approximately three-quarters of all produce consumed in the U.S. and Canada during the winter is imported through Nogales) [Ref. 12, p AZ-35]; and (3) California. There are very few movements to places directly south of Manitoba (North Dakota and South Dakota), and almost no movements to the west of the U.S.

Only one of the carriers has operations into Mexico. The other carriers: (1) are not attracted to the idea of starting businesses in Mexico; (2) have not had the contacts to start operations into Mexico; or (3) do not want to go into Mexico because they think that operating costs are higher due to a lot of hidden costs involved with these operations (for example, damage to trailers).

The major commodities moved into the U.S. include farm machinery, construction equipment, steel, bulk grain, fertilizer, auto parts, furniture, paper (from Kenora, Ontario), chemicals, hay, retail merchandise, meat (from Alberta), frozen french fries (from Manitoba), agricultural commodities, dry food products, peat moss, fish, and other general freight (as can be noted, most of these commodities are the same as those obtained from the Emerson scale survey). One of the carriers moves raw material from Toronto to El Paso, Texas. The truck picks up a load of appliances at El Paso and returns to Canada.

The major commodities moved into Canada from the U.S. are produce (from Nogales, Arizona), books, electrical appliances, fertilizer, construction equipment, farm products, farm equipment, lumber (from Washington), and parts for manufacturing (from the Ohio area).

The major commodities moved across Canada are food products, glass, retail merchandise, construction equipment, motorcycle parts and other general freight.

Most of the carriers travel on I-29 from the Manitoba-U.S. border to Fargo, North Dakota and mainly on I-94 from Fargo to the destinations in the U.S. Midwest or northeast. Traffic running between Winnipeg and eastern Canada is often routed across U.S. Route 2 through Wisconsin. This is because (1) it is shorter in distance; (2) the travel time is shorter; (3) the roads are in better condition; (4) the operating cost is lower than running on the TransCanada Highway; (5) fuel in the U.S. is cheaper; and (6) the roads are safer in winter.

Most of these in-transit operations take place across the Pembina-Emerson crossing. However, some trucks move across the Roseau-South Junction crossing and the Warroad-Sprague crossing. The selection of the crossing depends on things such as: (1) the destination of the load; (2) the origin of the load; (3) customer requests; (4) where loading took place; and (5) the weight of the load. For example, the operation of one of the carriers surveyed is as follows: (1) if a load is going from Winnipeg to Chicago, it crosses at the Roseau-South Junction port of entry; (2) if the load is moving in transit from Ontario to Winnipeg, the Warroad-Sprague port of entry is used; and (3) if the load is moving into Manitoba and it has not been pre-cleared, then it goes through the Pembina-Emerson crossing. Two other carriers discussed the crossing selection based on weight. These carriers use mostly the Pembina-Emerson crossing, except when the vehicles are overweight. If the load is in-transit, the Warroad-Sprague crossing is used. If the load is moving southbound, the Gretna-Neche crossing is used.

For all the carriers, most of the operations into the U.S. involve triangulation. A basic triangulation operation from a terminal in Winnipeg consists of the following: (1) Winnipeg with paper to Wisconsin; (2) building materials pick up in Wisconsin for drop off in Toronto; (3) retail merchandise pick up in Toronto for drop off in Winnipeg.

A different type of operation involves: (1) Manitoba with farm equipment to Kansas; (2) the vehicle dead-heads from Kansas to Nebraska; (3) load pick up in Nebraska for drop off in western Canada; (4) lumber pick up in western Canada for drop off in Manitoba.

Similar operations to the U.S.-Mexico border by one of the carriers involve: (1) Winnipeg with frozen french fries to Laredo, Texas; (2) the vehicle dead-heads from Laredo, Texas to Nogales, Arizona on I-10; (3) Nogales, Arizona with produce to western Canada; (4) load pick up in western Canada for drop off in Winnipeg. The operation of another carrier involves: (1) load of furniture to Laredo, Texas; (2) vehicle dead-heads to Nogales, Arizona; (3) produce pick up in Nogales, Arizona for drop off in Manitoba.

4.2.4 Transborder Surface Freight Database [Ref. 13]

This section presents value-related trade data obtained from the 1994 Transborder Surface Freight Database released by the U.S. Bureau of Transportation Statistics. The trade data presented in this section apply to the nine corridor States and Manitoba only.

Value-related trade data are difficult to understand and interpret in terms of TS&W policy considerations. The reason is that this type of data does not provide information related to the weight or size of a shipment. Nonetheless such data do give certain indications about the role and importance of various border crossings and highways.

Land exports to Manitoba across the Manitoba-U.S. border was valued at US$ 3.4 billion in 1994. Truck accounted for almost 90 percent of these exports, rail accounted for 10 percent and other land modes accounted for almost 2 percent. These land exports from the U.S. to Manitoba represent only 2.6 percent of the total land exports from the U.S. to Canada.

The value of the land exports from the nine corridor States to Manitoba is distributed as shown in Table 4-11. In 1994, Minnesota was the corridor State with the largest total dollar value of exports (US$ 468 million--US$ 460 by truck and US$ 8 by rail) to Manitoba. The State that shows the highest use of rail for value-related exports to Manitoba is Texas.

In 1994 four crossings accounted for 99 percent of Manitoba imports from the U.S. by truck by value. These crossings were Pembina-Emerson, Roseau-South Junction, Dunseith-Peace

Garden, and Noyes-Emerson East. In this case, the final destination of the imports going through these crossings was Manitoba. [Ref. 5]:

• Pembina-Emerson	90 percent of total imports from the U.S. into Manitoba
• Roseau-South Junction	4 percent of total imports from the U.S. into Manitoba
• Dunseith-Peace Garden	3 percent of total imports from the U.S. into Manitoba
• Noyes-Emerson East	2 percent of total imports from the U.S. into Manitoba

Table 4-11

1994 Exports from the Corridor States to Manitoba

(Millions of Dollars)

State	Truck	Rail	Total
North Dakota	128	4	132
South Dakota	17	0.4	17
Nebraska	41	0.2	41
Minnesota	460	8	468
Iowa	161	7	168
Missouri	60	13	73
Kansas	82	1	83
Oklahoma	15	4	19
Texas	83	35	118
Total	1,047	73	1,120

Source: Reference 5

In that same year, the same four crossings accounted for 98 percent of the imports into Canada for which the final destination was not Manitoba. In this case, these crossings were used to enter the country but the final destination of was not necessarily Manitoba. [Ref. 5]:

• Pembina-Emerson	86 percent of total imports from the U.S. into Canada
• Noyes-Emerson East	6 percent of total imports from the U.S. into Canada
• Roseau-South Junction	4 percent of total imports from the U.S. into Canada
• Dunseith-Peace Garden	2 percent of total imports from the U.S. into Canada

From the Transborder database, major commodities that move into Manitoba through crossings on the Manitoba-U.S. border are vehicles, nuclear reactors and machinery, books and other paper products, electrical machinery and equipment, chemicals, plastics. In 1994, these six commodities accounted for 61 percent of movements by value into Manitoba.

4.3 Commodity and Trade Flows Between Mexico and the Corridor

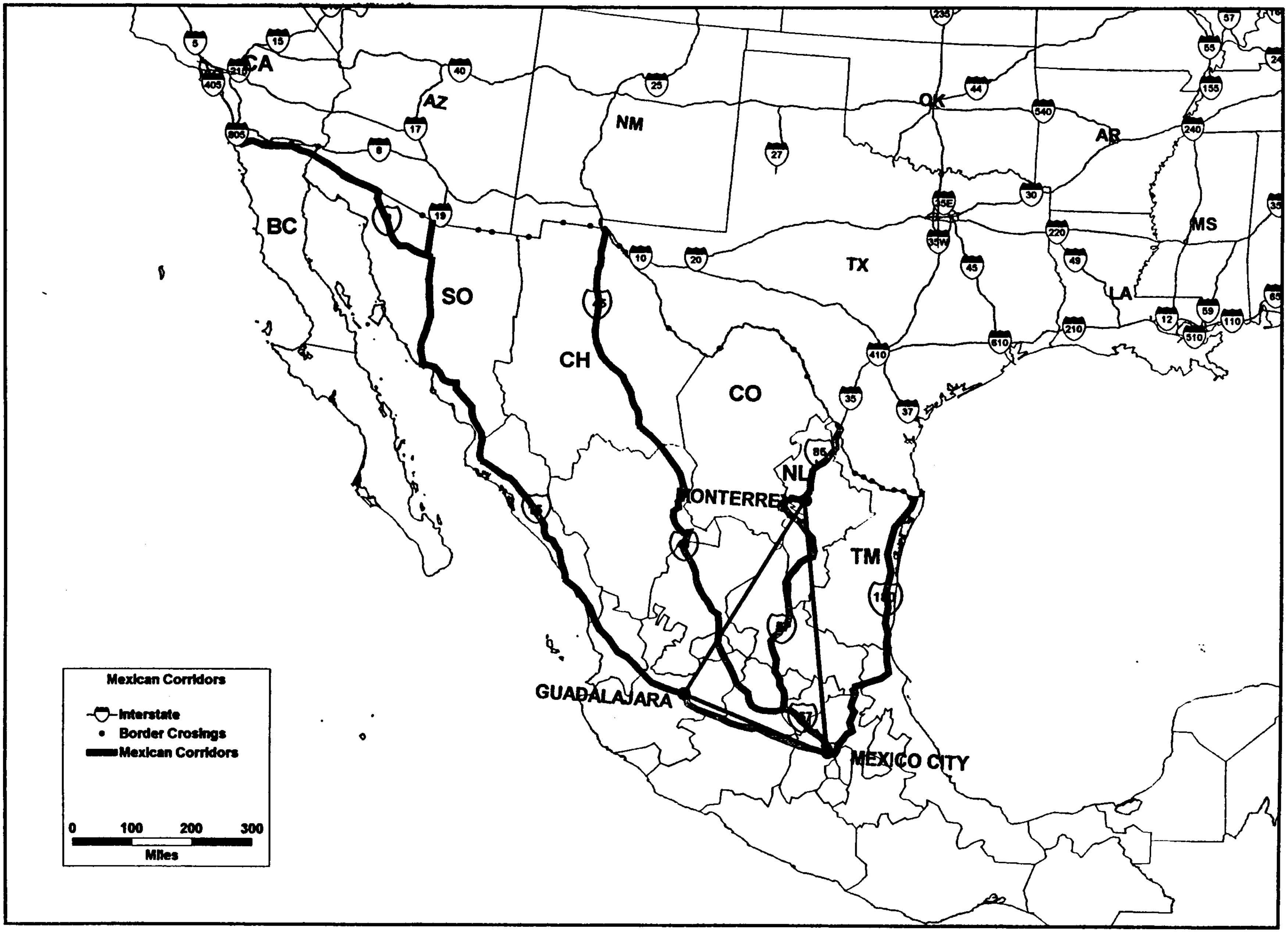
Freight movements between the U.S. and Mexico are of three types: (1) local crossborder trade; (2) movements which are maquiladora-related; and (3) long haul movements primarily to and from Mexico's "commercial triangle" of Monterrey, Guadalajara and Mexico City (Figure 4-3).

The maquiladora industry, primarily located south of the U.S.-Mexico border, is a very important trade generator in Mexico. The maquiladora establishments are "in-bond" border factories which import raw material duty-free and export finished products, with U.S. tariffs paid only on the value added. Important products entering the U.S. from these plants include transportation equipment, apparel, electronics, metal products, and other consumer goods. [Ref. 7, p 49].

The maquiladora industry emerged in 1965 with a few small plants. Currently, there are more than 2,000 maquiladoras in the six Mexican border States, employing approximately one-half million workers. [Ref. 8, p 4]. Recently, some maquiladoras have been established in the interior of the country, especially near Guadalajara. The maquiladoras operating outside the northern Mexican border region account for approximately 15 percent of the total. [Ref. 9, p 39].

There are four major north-south corridors in Mexico that carry most of the land trade between Mexico and the United States: [Ref. 6, p 23]. These corridors are shown in Figure 4-3.

Figure 4-3
Mexican Commercial Triangle and Major North-South Corridors



Source: Developed from Reference 6 by J. Montufar

- The Pacific Corridor--which originates in Tijuana, Baja California Norte as Federal Highway 2, intersects with Federal Highway 15 at Santa Ana, Sonora and continues south as Federal Highway 15 through Hermosillo, Sonora to Guadalajara, and ends in Mexico City.

- The Chihuahua Corridor--which originates in Ciudad Juarez, Chihuahua as Federal Highway 45, extends south through Torreón, Coahuila where it becomes Federal Highway 49, and ends in Mexico City as Federal Highway 57.

- The Central Corridor--which originates in Nuevo Laredo, Tamaulipas as Federal Highway 85 and extends south through Monterrey and San Luis Potosí, and ends in Mexico City as Federal Highway 57. This is the corridor that directly connects with I-35 in the U.S.

- The Gulf Corridor--which originates in Matamoros, Tamaulipas as Federal Highway 180 and extends south through Tampico, Tamaulipas, and ends in Mexico City.

4.3.1 Transborder Surface Freight Database

An extensive analysis of the database was conducted for the entire U.S.-Mexico border. The Transborder database includes data about U.S.-Mexico trade by value. Land transportation is the dominant mode for U.S.-Mexico trade, accounting for 90 percent of the $45.9 billion U.S. exports to Mexico in 1994. Trucking accounts for 85 percent of this total and rail accounts for 9 percent. In 1994, almost 40 percent of U.S. exports to Mexico by value moved through Laredo, 20 percent through El Paso, and 8 percent through Brownsville. Major commodities that move through the Texas-Mexico border include electrical machinery, transport equipment, minerals, metal products, apparel, and industrial machinery.

4.3.2 Mexican Transportation Institute

The Mexican Transportation Institute has conducted a series of studies related to U.S.-Mexico trade. Two of the studies are of particular importance to this research:

1. "Problemas de Conectividad en Juarez, Chihuahua" (Connectivity Problems in Juarez, Chihuahua), 1995

2. "Problemas de Conectividad en Nuevo Laredo, Tamaulipas" (Connectivity Problems in Nuevo Laredo), 1995

The following information regarding trade and commodity movements across the U.S.-Mexico border is presented in those two studies:

Value-related information

- In 1991, the crossings of Laredo-Nuevo Laredo and El Paso-Ciudad Juarez on the Texas-Mexico border, accounted for 48 percent of total U.S. imports from Mexico by value--Laredo accounted for 44 percent and El Paso accounted for 4 percent. [Ref. 10, p 17].

- In that same year, these two crossings also accounted for two-thirds of total U.S. exports to Mexico by value--Laredo accounted for 59 percent and El Paso accounted for 7 percent. [Ref. 10, p 17].

Weight-related information

- In 1989 rail exports to Mexico were estimated at 6.9 million metric tonnes and imports from Mexico were estimated at 2.7 million metric tonnes. Table 4-12 shows the percentage of exports to Mexico and imports from Mexico by port of entry by rail. [Ref. 11, p 40].

- The Mexican trucking industry moved approximately 37 million metric tonnes across the U.S.-Mexico border in 1989. [Ref. 11, p 34].

Commodity-related information

- Trade between the U.S. and Mexico involves the movement of two types of commodities: (1) high value with high technological content commodities; and (2) low value resource-based commodities. Of the trade that moves through Laredo, high-value commodities account for 45 percent of the total value but only 13 percent of the total weight in metric tonnes. The low-value, resource-based commodities account for almost 18 percent of the total value and one-half of the total weight. [Ref. 11, p 17].

Table 4-12

1989 Rail Trade Across the U.S.-Mexico Border

Port of Entry	Exports to Mexico [% of total]	Imports from Mexico [% of total]
Laredo - Nuevo Laredo	57.4	35.8
Brownsville - Matamoros	16.8	8.1
Eagle Pass - Piedras Negras	14.4	15.4
El Paso - Ciudad Juárez	7.3	21.6

Source: Reference 11

Some aspects of U.S.-Mexico trade moving through the Laredo-Nuevo Laredo crossing in 1990 are depicted in Table 4-13. [Ref. 11, p18-21].

Table 4-13

Major Commodities Moved Through Laredo, Texas in 1990

(value in thousands of US dollars, weight in metric tonnes)

Commodity	**Imports from Mexico**		**Exports to Mexico**	
	Value	**Weight**	**Value**	**Weight**
Industrial Machinery	498,494	90,368	1,447,952	204,754
Electrical Machinery	229,783	75,705	683,814	213,057
Rubber and Plastics	101,333	62,913	425,935	325,548
Transport Equipment	251,174	NA	345,156	NA
Chemicals	118,457	193,284	200,625	225,042
Minerals	86,221	118,765	NA	NA
Paper and Paper Products	91,059	121,878	157,751	166,234
Agricultural Products	87,054	77,625	142,075	352,270
Wood products	NA	NA	216,984	708,166
Cereals	NA	NA	150,113	1,056420
Other	1,566,500	1,258,325	2,896,052	2,890,461
Total	3,030,075	1,998,863	6,666,457	6,141,952

NA - Information not available

Source: Reference 11

- Industrial machinery accounted for 16 percent of U.S. imports from Mexico by value and 5 percent by weight. It also accounted for 22 percent of U.S. exports to Mexico by value and 3 percent by weight.

- Electrical machinery and electronics accounted for 8 percent of U.S. imports from Mexico by value and 4 percent by weight. They also accounted for 10 percent of U.S. exports to Mexico by value and 3 percent by weight.

- Cereals made up about 2 percent of U.S. exports to Mexico by value and almost 15 percent by weight.

4.3.3 "Trade Truck" Flows in the U.S.-Mexico Border

Estimates of the flow of "trade trucks" along and down to the U.S.-Mexico border are presented in a paper by Dr. John McCray [Ref. 14]. He defines a "trade truck" as a fully loaded 48-foot trailer. McCray estimates the number of trade trucks using various highway links in the border region through a proprietory procedure which converts trade flow data into estimates of trade trucks. Those estimates are then assigned to specific highway links. I-35 is the major highway which moves trade between Laredo and Dallas. North of Dallas, most of the "trade truck" volumes are to and from the eastern area of the U.S. Volumes on I-35 become minor compared to flows on highways to the east of Dallas (I-30 and I-40). This is illustrated in Figure 4-4.

4.4 Summary

This chapter presents selected characteristics about commodity and trade flows of potential relevance to the consideration of TS&W policy options.

Commodity and trade flows within the U.S. and the corridor

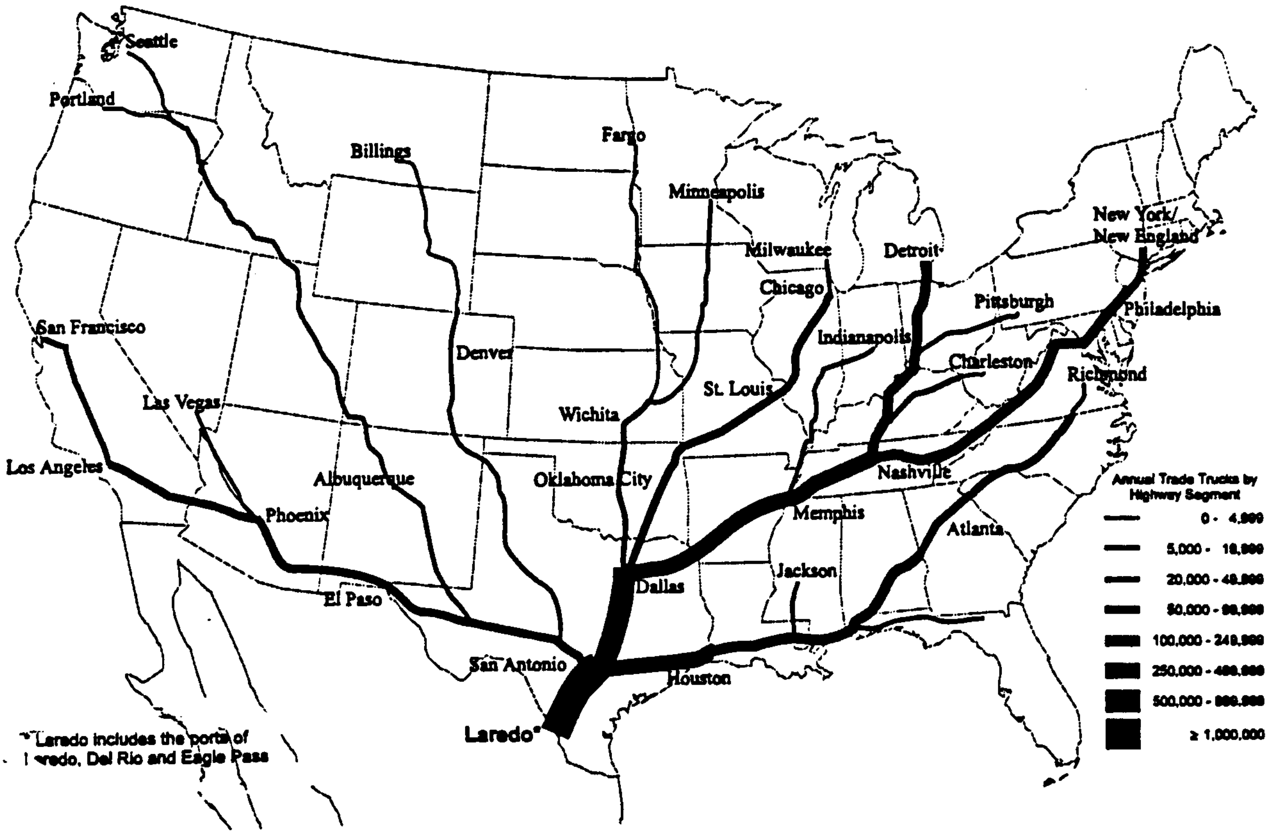
From the Transearch database:

- The database considers 408 million tons of commodities moved by truck and rail within and between the corridor States in 1994. This is the equivalent to 44,723 25-t trucks/day.

Figure 4-4

1994 "Trade Truck" Volumes to and from Laredo

(annual number of "trade trucks" by highway segment)



Source: Taken from Reference 14

- Movements by truck account for 71 percent of the total movements. Movements by rail account for 29 percent of the total movements.

- A few commodities account for the major share of total tonnage hauled by both truck and rail. Commodities moving by truck in large quantities are building materials, food, petroleum and products, and chemicals (together accounting for more than 80 percent of truck tonnage). Commodities moving by rail in large quantities are ores and minerals, farm chemicals, food and coal (together accounting for more than 80 percent of rail tonnage). Food, chemicals and building materials are important "weight" commodities for both truck and rail throughout the corridor States.

- There are 49,230 25-t trucks/day of movement between the corridor States and other States. This accounts for more than four times the interstate movement between the corridor States themselves. Almost three-quarters of this movement is to and from east of the corridor States, and about one-third is to and from west of the corridor States.

- Trucking accounts for more than one-third of the movement to and from the west and rail accounts for nearly two-thirds. Major commodities moved from the west into the corridor States by truck include food, farm products and building materials; and by rail include coal, farm products and FAK. Major commodities moved to the west from the corridor States by truck include food, petroleum and products, and chemicals; and by rail include chemicals, food and FAK.

- Trucking accounts for almost two-thirds of the movement to and from the east, and rail accounts for more than one-third. Major commodities moved from the east into the corridor States by truck include food, chemicals and paper; and by rail include chemicals, transport equipment and paper and print. Major commodities moved to the east from the corridor States by truck include food, chemicals, and petroleum and products; and by rail include chemicals, food and farm products.

- There are 20,250 25-t trucks/day of movement crossing the corridor States between States to the west and States to the east (this excludes all coal moving eastbound by rail). This is nearly twice as much that moves interstate between the corridor States themselves. Truck and rail both handle about one-half of the tonnage moved across the corridor.

- In terms of competitive interstate movement, from the standpoint of the consideration of TS&W policy options on truck-rail diversion: (1) each of the corridor States has potentially important truck-rail diversion opportunities; and (2) interstate movements to and from the corridor States involving food and chemicals are particularly important.

From the 1993 Commodity Flow Survey:

- For the nine corridor States combined: (1) trucking handles about 60 percent of the originating tonnage--mainly in private (54 percent) versus for-hire (46 percent) trucks; (2) rail handles about one-sixth of the originating tonnage; (3) about 1 of 500 tons originating in these nine States is moved intermodally--mainly by truck and rail.

- For the nine corridor States combined: (1) short haul shipping distances (less than 250 miles) account for 88 percent of all tons moved by truck; (2) long haul shipping distances (250 miles and more) account for 56 percent of all tons moved by rail; and

(3) the quantity of tonnage moved by rail long haul shipping distances is about 30 percent more than the quantity moved by truck.

- Six commodities--nonmetallic minerals, farm products, food or kindred products, petroleum or coal products, clay products, and chemicals or allied products--account for almost 85 percent of all tons originating in the nine corridor States combined.

Commodity and trade flows between Canada and the corridor

From Statistics Canada:

- The three major destinations of Manitoba exports by value in 1994 were: (1) Minnesota--20.8 percent of the total; (2) North Dakota--18.6 percent of the total; and (3) Pennsylvania--5.2 percent of the total. In the same year, the three major origins of Manitoba imports by value were: (1) Illinois--14.7 percent of the total; (2) Minnesota--13.8 percent of the total; and Wisconsin--7.0 percent.

- The three major Manitoba exports by value in 1994 were: (1) motor vehicles, which accounted for 22.5 percent; (2) mineral products, accounting for 18.2 percent; and (3) machinery, accounting for 11.7 percent of the total. The three major imports into Manitoba were: (1) machinery, accounting for 28.8 percent of the total; (2) motor vehicles, which accounted for almost one-quarter of the total; and (3) wood/pulp and paper, accounting for 7.7 percent of the total.

From the Emerson Scale Survey:

- The three major destinations of loaded trucks traveling southbound through the Emerson Scale are: (1) Minnesota--26 percent of total movements; (2) North Dakota--16 percent of total movements; and (3) Illinois, Wisconsin and South Dakota--6 percent of total movements each. The major origins of loaded trucks traveling northbound through the scale are: (1) Minnesota--26 percent of total movements; (2) North Dakota and Illinois--12 percent of the total each; and (3) Wisconsin and Iowa--6 percent of total movements each.

- Two-thirds of the loaded southbound movements are destined for the corridor States. Of the two-thirds, 9.4 of 10 movements are destined for places north of Kansas City and the remainder are destined for places south of Kansas City.

- More than one-quarter of total loaded southbound movements are destined for States east of the corridor States and 5 percent are destined for States west of the corridor States.

- Major northbound commodities through the Emerson scale include machinery, fresh farm products, paper and paper products, animal feed, and lumber and fabricated wood. Major southbound commodities include live animals, machinery, lumber and fabricated wood, and fresh farm products.

From the Manitoba-based Truck Load Carrier Survey:

- For most of the carriers, more than one-half of their operations either originate or end in the U.S. The major destinations are the U.S. Mid-west, northeast, and the Great Lake Region (mainly Minnesota, Iowa, Illinois, Wisconsin, Indiana, Michigan, New York, Ohio, Kentucky, Iowa, Georgia, and Tennessee). There are no movements to the west of the U.S. Less than one-half of the carriers have the U.S.-Mexico border as the major origin or destination. Only one of the carriers has operations into Mexico.

- Major commodities moved into the U.S. include farm machinery, construction equipment, steel, bulk grain, fertilizer, auto parts, furniture, paper, retail merchandise, meat, agricultural commodities, frozen french fries and dry food products. Major commodities moved into Canada from the U.S. are produce, electrical appliances, fertilizer, construction equipment, farm products, farm equipment, lumber, and parts for manufacturing. Major commodities moved across Canada are food products, bulk glass, retail merchandise, and construction equipment.

- Most of the carries use I-29 as the main route from the Manitoba-U.S. border to Fargo, North Dakota and I-94 from Fargo to destinations in the U.S. Midwest or northeast. Traffic running between Winnipeg and eastern Canada is often routed across U.S. Route 2 through Wisconsin.

From the Transborder Surface Freight Database:

- In 1994, truck accounted for almost 90 percent of value related land imports to Manitoba across the Manitoba-U.S. border. The three major origin States for value related imports by truck were: (1) Minnesota--44 percent of total imports; (2) Iowa--15 percent; and (3) North Dakota--12 percent of total imports into Manitoba by truck.

- Six commodities accounted for almost two-thirds of movements into Manitoba through crossings in the corridor in 1994. These are vehicles, machinery, paper products, electrical machinery, chemicals, and plastics.

Commodity and trade flows between Mexico and the corridor

- Freight movements between the U.S. and Mexico are of three types: (1) local crossborder trade; (2) movements which are maquiladora-related; and (3) long haul movements primarily to and from Mexico's commercial triangle. [Ref. 7, p ES-1]. The maquiladora factories, primarily located along the U.S.-Mexico border, are a very important trade generator in Mexico. Main products entering the U.S. from these plants include transportation equipment, apparel, electronics, metal products, and other consumer goods.

- In 1994, almost 40 percent of U.S. exports to Mexico by value moved through Laredo, 20 percent through El Paso, and 8 percent through Brownsville.

- According to the paper by Dr. John McCray, most of the northbound trade flow is destined for the U.S. northeast and north central regions. The I-35 component of the Mid-continent corridor carries large volumes of "trade trucks" only in the segment between Laredo and Dallas. North of Dallas, flows are oriented to the eastern U.S. on Interstate highways 30 and 40.

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5.0 Truck Size and Weight Policy Options

This chapter defines, and compares and contrasts, plausible near term TS&W policy options relating to trucking in the Mid-continent corridor. The nature of the possible effects of these policy options is the principal concern of the analysis.

Three groups of policy options are considered: (1) those being investigated in the U.S. Department of Transportation Comprehensive Truck Size and Weight Study; (2) those being considered in negotiations under the Land Transportation Standards Subcommittee on Vehicle Weights and Dimensions under the NAFTA; and (3) Canadian and Mexican accommodation of selected aspects of U.S. TS&W policy.

5.1 Policy Options of the U.S. Comprehensive TS&W Study

The primary objectives of the U.S. Department of Transportation Comprehensive Truck Size and Weight Study are:

- to assess the potential economic, safety, and environmental impacts of changing existing TS&W limits; and
- to identify opportunities to increase the efficiency of freight transportation while preserving a safe and efficient highway infrastructure.

To date, the Study has identified five illustrative policy options, and a series of sub-options: [from Federal Register Notice Vol. 61, No. 81, April 1996 and subsequent material].

1. Status Quo
2. Expanded Federal Control on the National Highway System

- Oberstar Bill
- STAA Size Provisions

3. State Flexibility
   - Lift LCV Freeze
   - Replace Grandfather Rights with LCV Permit Program
   - Triples Only
   - Heavy Doubles Only

4. International Considerations

5. TS&W Limits Rollback

5.1.1 Status Quo

This scenario retains all features of current Federal law, including the ISTEA freeze. The Federal law applies to the same highway network as it does today. State (and some local) laws apply in the same way and over the same highway networks as they do today.

<u>**Introductory Comments**</u>

The complexity and controversy surrounding TS&W law in the U.S. makes the status quo ("no change") option at a superficial level attractive to both decision makers and the public. As such, this research considers the essence of the status quo as a plausible, near term policy option that the U.S. Federal government could retain.

For the most part, status quo has been the U.S. TS&W policy position since the last major change of TS&W law in the Surface Transportation Assistance Act (STAA) of 1982. The other minor policy adjustment was the "freeze" placed on longer combination vehicle (LCV) operations as part of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. That freeze addresses very minor components of the total trucking activity in the U.S.

Status quo implies no change. But in fact, no change in Federal law neither means no change in trucking and nor does it mean no change in TS&W law governing that trucking.

With or without change in Federal law, the number of trucks, the quantity of trucking, the types of trucks employed, the fleet mix at any point on a highway, the operating characteristics of trucks, the pavement impacts of trucks, the performance properties of trucks from a stability and control standpoint, and the sphere on interest of Federal law on these matters will change, changes and continues to change.

Further, and with particular reference to the Mid-continent corridor, changes can and will occur under the status quo option in matters such as: (1) the numbers of semitrailers which are more than 53 feet in length in Kansas, Oklahoma and Texas; (2) the proportion of equipment of 102-inch width versus 96-inch width; (3) the numbers, mix of types, dimensional properties, and weights, of LCVs operating between Winnipeg, North Dakota, South Dakota and into Sioux City, Iowa under special permit or the ISTEA freeze; (4) the length of truck + trailer combinations since they are not controlled by the ISTEA freeze; (5) the extent of use of 14-foot vehicles in most of the corridor States; (6) the actual operating weights and payloads of various truck types; (7) the vehicle-miles of travel (VMT) per vehicle; (8) State-based enforcement and permitting policies and practices; and (9) the extent of use of split tandems, wide base tires, low profile tires, and lift axles.

In addition, the status quo option concerning Federal law does not mean that TS&W regulations governing trucking will remain constant. This is because many of the State regulations, and enforcement and permitting policies and practices, which can significantly influence trucking in local and regional operations, would be free to change. For example, within the last year, North Dakota entered into an agreement with Manitoba about the one-directional weighing of trucks. Under this agreement, North Dakota has modified its enforcement practices for northbound trucks operating on I-29 and entering Manitoba. These trucks are now not weighed at the Joliette scale in North Dakota, but at the Emerson scale in Manitoba. The practical implication of this is that northbound trucks on this highway section are subjected to enforcement of Canadian law and not the lower limits of the North Dakota law. There are also recent examples of changes in U.S. Federal law which have altered the essence of the Federal TS&W law. In the Mid-continent corridor, the NHS Bill has a special provision that allows triple trailer units to enter Iowa on the I-29 for pick ups and deliveries in Sioux City, Iowa. This is in apparent contravention of the ISTEA freeze.

Changes or modifications in Canadian and Mexican law can also impact trucking in the Mid-continent corridor. For example, modifications of western Canadian TS&W law to accommodate split tandems, 14-foot heights, lift axles or other common U.S. conditions will influence trucking across the western U.S.-Canada border. Another example could be a relaxation of Mexico's tractor-semitrailer length limit of 20.8 meters to facilitate crossborder movements of 53-foot semi-trailers. This could change some of the vehicle characteristics of trucks operating across the U.S.-Mexico border.

Detailed Provisions of the Status Quo Option

Basic (non-ISTEA related) Federal size limits (102-inch maximum/minimum vehicle width, 48-foot minimum semitrailer length, and 28-foot minimum trailer length for double-trailer combinations) remain on IS and NN highways. These Federal size limits would not be applied to NHS highways which are not NN highways.

Because these are minimum Federal length limits, they "facilitate" as distinct from "limit" regulations. In the case of width limit, being a minimum/maximum, it is both a facilitating and a limiting regulation. In practice, its real effect has been to facilitate rather than restrict.

There are 6,894 miles of NHS-not NN highways in the Mid-continent corridor States that could potentially be affected by this policy. Nearly half of this mileage is in Texas.

A status quo policy concerning the basic Federal length limits is immaterial for effectively all trucking within, between, to and from, and across the corridor States. This is because the Federal length limits are minimums, and are equalled or exceeded on all NHS highways which are not NN highways in the corridor States, and probably all other NHS highways--as well as connecting Canadian and Mexican highways--which involve important freight movements. However, the status quo policy relating to basic length limits could become material if it allowed States the opportunity to restrict length limits on certain NHS-not NN highways to something less than the STAA minimum length limits.

A status quo policy concerning the Federal width limit is material. The Federal maximum/minimum width limit of 102-inches is equalled on all NHS highways which are not NN highways in all corridor States except in Iowa and Missouri, and probably on all similar highways to the west of the corridor. In Iowa and Missouri, and in several States to the east of the I-35 segment of the corridor, certain NHS highways which are not NN highways are limited to 96-inch vehicle widths. Thus, a status quo policy would retain the existing non-standard width limit--and the implications of it (such as restricting or prohibiting the use of more stable, 102-inch width vehicles in certain operations)--for trucking involving certain NHS highways within the corridor and beyond the corridor States, particularly to the east. As is the case with the basic length limits, the status quo policy relating to the width limit would leave States the opportunity to restrict width limits on an any NHS-not NN highway to something less than the STAA maximum/minimum width limit.

Basic (not otherwise grandfathered and non-ISTEA related) Federal weight limits (20,000-pound single- and 34,000-pound tandem-axle limits, 80,000-pound cap, and Bridge Formula B) remain on IS highways as do existing grandfather rights.

A status quo policy concerning the axle weight limits of the Federal law combined with grandfather right considerations results in the following variances from the 20,000-pound/34,000-pound standard limits on IS and NHS-not IS highways in the corridor States:

(1) Minnesota's axle weight limits are 10 percent higher in winter months on both IS and NHS highways; (2) Missouri's axle weight limits on most NHS highways which are not IS highways are 22,000-pound single and 36,000-pound tandem; (3) Missouri's axle weight limits on both IS and NHS highways in the four commercial zones are 22,400-pounds per axle; (4) North Dakota's 48,000-pound tridem axle limit on non-IS highways in non-winter months; (5) North Dakota's axle weight limits on non-IS highways are 10 percent higher in winter months; (6) In Texas, given the purchase of the 5 percent tolerance policy annual permit, higher axle limits apply to most non-IS highways. This 5 percent tolerance permit is readily-available for any vehicle which is otherwise registered for 80,000 pounds GVW and is capable of operating at the higher GVW authorized by the permit (80,000 * 1.05 = 84,000 pounds). Within the permitted GVW limit of 84,000 pounds, a 10 percent tolerance on individual axle weights is allowed (22,000, 37,400 and up to 47,850 pounds on single, tandem and tridem axles respectively).

A status quo policy concerning the axle weight component of the Federal law combined with grandfather right considerations leaves about 40 percent of the total 29,503 miles of NHS-not IS miles in the corridor States (in South Dakota, Nebraska, Iowa, Kansas and Oklahoma) subject to 20,000 and 34,000 pounds single and tandem axle weight limits year round. Approximately 60 percent of the NHS-not IS mileage in these States is subject to higher axle weight limits--by law in Missouri, by tolerance permit in Texas, and by winter weight allowance for selected months in North Dakota and Minnesota.

A status quo policy concerning the gross vehicle weight component of the Federal law combined with grandfather right considerations leaves the following situations where the 80,000-pound cap does not apply in the corridor States year round: (1) in Minnesota, 88,000 pounds on IS and NHS highways in the winter months; (2) in Missouri on IS and NHS highways in the four commercial zones (22,400 pounds * number of axles); (3) in Kansas, 120,000 pounds on the Kansas Turnpike, 110,000 pounds on a connecting section of the I-70 with Colorado, and 85,500 pounds on all NHS highways which are not IS highways; (4) in

Oklahoma, 90,000 pounds on all IS and other NHS highways; (5) in Texas, 84,000 pounds on all NHS highways which are not IS highways; (6) in North Dakota, 105,500 pounds on all highways; (7) in South Dakota, 129,000 pounds on all highways; and (8) in Nebraska, 95,000 pounds on all highways.

A status quo policy concerning the gross vehicle weight component of the Federal law combined with grandfather right considerations leaves 58 percent of the total of 9,607 miles of IS highways in the corridor States limited to 80,000-pound gross vehicle weight year round. The same policy leaves only about one-fifth of the total of 29,503 miles of NHS highways which are not IS highways in the corridor States limited to 80,000-pounds gross vehicle weight year round. The remaining four-fifths of the NHS-not IS highways would have a higher GVW limit by law, by permit, or by winter weight allowance.

A status quo policy concerning the Bridge Formula B component of the Federal law combined with grandfather right considerations leaves three situations in the corridor States where Bridge Formula B does not apply year round: (1) in Minnesota with the 10 percent winter weight allowance on all highways; (2) in Texas with the 5 percent tolerance permit on all non-IS highways; (3) in North Dakota with the 10 percent winter weight allowance on all non-IS highways.

The operation of long-combination vehicles (LCVs)--being any combination of a truck tractor and two or more trailers or semitrailers which operates on the Interstate System at a gross vehicle weight greater than 80,000 pounds--is restricted to what was in use on June 1, 1991.

For States having grandfather rights (in this corridor, North Dakota, South Dakota, Nebraska, Missouri, Kansas and Oklahoma), TS&W regulations relating to vehicles and situations not addressed by the LCV aspect of the ISTEA freeze (such as the weight of truck + trailer combinations on IS highways) can be changed by States under this status quo option. No such changes are known to have been made since the ISTEA freeze in these corridor States.

The operation of commercial motor vehicles (CMVs)--being a vehicle combination with two or more cargo-carrying units operating on the National Network--is restricted to what was in use on June 1, 1991, subject to State restrictions on that date.

For States having grandfather rights (in this corridor, North Dakota, South Dakota, Nebraska, Missouri, Kansas and Oklahoma), TS&W regulations relating to vehicles and situations not addressed by the CMV aspect of the ISTEA freeze (such as the total box length on truck + trailer combinations) could be changed by States under this status quo option. No such changes are known to have been made since the ISTEA freeze in these corridor States.

5.1.2 Expanded Federal Control of TS&W on the NHS

This approach focuses on a special Federal role on the NHS in recognition of its importance for interstate and international commerce.

Introductory Comments

The National Highway System (NHS) was approved by Congress in 1995. [Ref. 2, p 4]. It includes all Interstate System (IS) highways and some National Network (NN) highways.

The entire National Highway System consists of 256,000 kilometers, which accounts for four percent of all roads in the U.S. [Ref. 2, p 4].

In developing the legislation for the NHS, Federal Highway Administration (FHWA) and in turn the U.S. Department of Transportation, agreed to investigate a number of proposals concerning the extension of Federal TS&W law currently applicable to the IS and NN system, to the new NHS system. These were encompassed in the "Oberstar Bill" which forms the basis of this policy option.

This research considers the essence of the Oberstar Bill as a plausible, near term policy option that the U.S. Federal government could institute.

Detailed Provisions of this Option

Restrict weight on non-Interstate portions of the NHS to Federal limits but grandfather currently higher state weight limits on the NHS and restrict semitrailer lengths on the NHS to a maximum of 53 feet but grandfather operation of existing semitrailers greater than 53 feet in length on the NHS where they may now legally operate. (Oberstar Bill).

The weight component of this policy would make many additional miles (29,503 miles) of highway in the corridor States subject to Federal grandfather provisions concerning gross vehicle weights, axle weights, and Bridge Formula requirements. The mileages of impacted highways that would become encompassed (*i.e.* brought within Federal jurisdiction) and impacted (*i.e.* in the sense of requiring grandfathering) by this policy from the gross vehicle weight standpoint are highlighted in Table 5-1. The mileages of not-encompassed/not-impacted highways are also shown (not shaded).

The semitrailer length component of this policy would make many new miles of highways in the three southern corridor States--both IS and NHS-not IS highways--subject to Federal grandfather provisions concerning semitrailer lengths. Affected highways would be:

Texas: 59-foot semitrailers--all IS (3,237 miles) and all NHS-not IS (10,355 miles) highways. (8,983 miles of NN-not NHS highways would be unaffected).

Oklahoma: 59.5-foot semitrailers--all IS (928 miles) and most NHS-not IS (2,273 miles) highways. (3,292 miles of NN-not NHS highways would be unaffected).

Kansas: 59.5-foot semitrailers--all IS (859 miles) and all NHS-not IS (2,912 miles) highways. (5,193 miles of NN-not NHS highways would be unaffected).

Table 5-1
Mileages of IS and NHS-not IS Highways Relevant to GVW Standpoint

	Mileage of IS highways (not to be newly encompassed)		Mileage of NHS-not IS (to be newly encompassed)	
State	Currently limited to 80 kip GVW year-round	Currently not limited to 80 kip GVW year round	Currently limited to 80 kip GVW year-round not impacted	Currently not limited to 80 kip GVW year round impacted
ND	NIL	572	NIL	1,579
SD	NIL	677	NIL	1,554
NE	NIL	478	NIL	2,044
IA	783	NIL	2,415	NIL
KS	620	239	NIL	2,901
MN	NIL	910	NIL	3,033
MO	955	208	2,765	558
OK	NIL	928	NIL	2,273
TX	3,237	NIL	NIL	10,355

The semitrailer length component of this policy would equal the semitrailer length limit for all IS and NHS-not IS highways in Minnesota, Iowa, North Dakota, South Dakota, and Nebraska. It would also equal the semitrailer length limit for all IS highways in Missouri, and many of the NHS highways in that State. Notwithstanding this, if the semitrailer length component of this policy was implemented as a "minimum/maximum (subject to grandfathering)" as distinct from a "maximum (subject to grandfathering)", it would extend the scope of the highway network on which 53-foot semitrailers could be operated in Missouri, Iowa and Minnesota (for long wheelbase tractors) because of the current effective prohibition of their use with limitations on tractor-semitrailer combination length (and different kingpin-setting specifications in Minnesota and Iowa).

About one-quarter of all van semitrailers classified in this research relating to the I-35 corridor States (6,134 in total) were at least 53-feet long. From the survey, there is a somewhat lesser use of 53-foot equipment in Minnesota and Iowa, and a greater use in

Missouri, Kansas, Oklahoma and Texas. The survey made no estimate of, and no data have been un-covered concerning, the use of semitrailers which are longer than 53-feet in Kansas, Oklahoma and Texas.

Extend Federal STAA size limits (102-inch maximum vehicle width, 48-foot minimum semitrailer length, and 28-foot minimum trailer length for double-trailer combinations) to the entire NHS. No State could exclude such vehicles from the NHS. The 80,000 pound GVW limit would remain on the Interstate System except where higher limits have been grandfathered (STAA Size Provisions). For the purposes here, it is assumed that this policy option would also envisage the continued application of Bridge Formula B on the IS highways except as otherwise grandfathered.

Many of the implications of this option have been discussed under the Status Quo. Elaboration follows.

This policy option as it concerns the basic Federal length limits is immaterial for effectively all trucking within, between, to and from, and across the corridor States. This is because the Federal length limits are minimums, and are equalled or exceeded on all NHS highways which are not NN highways in the corridor States, and probably all other NHS highways--as well as connecting Canadian and Mexican highways--which involve important freight movements.

The difference between this policy option and the status quo policy option as it concerns basic Federal length limits is that it would deny--rather than give--States the opportunity to (at some future time) restrict length limits on certain NHS-not NN highways to something less than the STAA minimum length limits.

This policy option as it concerns the Federal width limit is not immaterial. The Federal maximum/minimum width limit of 102-inches is equalled on all NHS highways which are not NN highways in the corridor States of Minnesota, Kansas, Oklahoma, Texas, North Dakota, South Dakota, and Nebraska on probably all similar highways to the west of the corridor. However, in Iowa and Missouri, certain NHS highways which are not NN highways are limited to 96-inch vehicle widths. Thus, for Iowa and Missouri (and several States beyond the corridor), this policy would extend the scope of the highway networks on which 102-inch equipment could be operated in place of 96-inch equipment (277 miles in Iowa--9 percent of Iowa's NHS highways; 1,186 miles in Missouri--26 percent of Missouri's NHS highways).

The other difference between this policy option and the status quo policy option as it concerns the Federal width limit is that it would deny--rather than give--States the opportunity to (at some future time) restrict the width limit on certain NHS-not NN highways to something less than the STAA maximum/minimum width limit of 102-inches.

The GVW limit component of this policy option is the same as the GVW component of the status quo option, discussed previously.

5.1.3 Increasing State Flexibility

This approach would increase State flexibility in controlling TS&W on all highway systems. It would include:

1. *Lift the Longer Combination Vehicle freeze which restricts the operation of LCVs on the Interstate highway system and [CMVs?] on the NN highway systems to those that were in use on or before June 1 1991. All other Federal size and weight controls would remain.*

How these ISTEA frozen States would exercise their newly re-established grandfather authority is not known.

2. *Replace grandfather provisions with Federally-regulated, State-voluntary permit programs for operation of combinations over 80,000 pounds GVW. Federal safety and infrastructure standards for operation of these vehicles would be established. Federal axle and bridge controls would remain.*

This option has innumerable possibilities. What the possibilities are, what scope of highway network might be considered, and what the State responses might be (both within and without the corridor)--and obviously what the implications might be--are not known.

3. *Triples only option*

4. *Doubles only option*

The options considering triples and doubles are still in the preliminary planning phase by the U.S. Federal Government and are not publicly available. Wide scale development of networks is not considered a near term plausible option.

While it is reasonable to argue that some form of the increased State flexibility option is possible--even in the near term--detailed consideration of it is not feasible within the context of this research.

5.1.4 International Considerations

This approach focuses on continuing concern about overweight international container movements. One scenario is that States would be required to allow use of a six-axle tractor-semitrailer combination at a gross weight limit of 97,000 pounds (for this configuration only). This scenario assumes establishing axle weight limits to avoid over-stressing bridges and establishing minimum Federal safety standards for operation of these vehicles. Two alternative systems are: (1) to require States to allow this vehicle on the Interstate System only; (2) to require States to allow this vehicle on the entire NHS.

Introductory Comments

The need to move fully-loaded 40-foot international containers on trucks in the U.S. has lead to a problem of overweight trucking in many States in relation to the Federal TS&W law. States have been authorized to issue non-divisible permits to allow the movement of these containers that by-pass Federal TS&W regulations.

Europe and many other countries have accommodated international containers in their TS&W laws without the need of special permitting.

This research considers this option as a plausible, near term policy option that the U.S. Federal Government could institute.

Detailed Provisions of this Option

If this policy option allowed the use of this configuration at this GVW level only when carrying international containers, its practical implications in terms of operating efficiencies would be minor in the corridor States.

- The movement of international containers on the rural highway sections in the corridor States is minor.
- Areas of some concentration of international container movement that could benefit from this option are the Houston port area, movements to/from maquiladora plants in Mexico, and drayage operations to and from rail in and around major urban centers in the corridor.
- In practice, drayage movements of international containers are already taking place at legal weights, under permit, illegally, or under special weight provisions of some of the urban areas. For example, this combination could operate at even a higher GVW limit within the commercial zones of Missouri--restricted only to 22,400-pounds per axle.

- Restricting this option to international containers only, on IS highways only (and to a lesser extent, the NHS only), would have imperceptible implications. Reasonable access to these networks would be essential to make the option meaningful.

The implications of this policy option would be different--possibly substantial--if it allowed the use of this six-axle tractor-semitrailer configuration at the 97,000-pound GVW level in all circumstances, and not just for hauling international containers.

- The major potential use of this vehicle is in four situations: (1) truckload operations specializing in hauling higher density commodities which are regularly weighting-out under current regulations (e.g. petroleum, lumber, gravel, grain, fertilizer, some food products, steel, paper rolls); (2) selected truckload operations where the flexibility of offering the higher weight payloads possible with these units could prove useful (e.g. some general flatbed operations, refrigerated van operations, some general freight operations); (3) container hauling; (4) operations requiring or desiring flexibility in the distribution of load among axles, such as "water level loading".

- Commodities for which these units are potentially attractive are: (1) of relatively low value; (2) moved over short haul distances; or (3) involve off-rail origins and destinations. Much of the trucking activity in the corridor involves these commodity characteristics.

5.1.5 TS&W Limits Rollback

This option considers rolling-back U.S. Federal TS&W law to its status as of the early 1970s. This would include reducing vehicle length limits (e.g. 45-foot semitrailer lengths) and GVW limits (e.g. 73,280-pounds).

This research does not consider this a plausible, near term policy option.

5.2 LTSS NAFTA Negotiations

The United States has made it known in the NAFTA discussions about TS&W that their domestic policy will not be driven by NAFTA discussions. Instead, any proposed TS&W

changes that might come forth from the NAFTA discussions would have to compliment findings of the TS&W study.

The NAFTA TS&W negotiations are focusing on three considerations at the present time: (1) documenting existing TS&W provisions for the three countries, and sharing these with the industry. This is to ensure that transport equipment manufacturers and highway transport carriers have easy access to accurate size and weight information within the three countries; (2) limiting discussions to NAFTA options which would comfortably fit within the current basic U.S. Federal TS&W limits as they apply to 5- and 6-axle tractor-semitrailers and to 5- and 6-axle A train double combinations; and (3) encouraging national governments to support on-going local and regional discussions of TS&W options. [Ref. 4].

5.3 Canadian and Mexican Accommodation of Selected Aspects of U.S. TS&W Policy

The major TS&W policy options governing the Mid-continent corridor are U.S.-based. There are some important differences between Mexican and Canadian laws with U.S. laws governing this corridor. Both Manitoba and Mexico may benefit from pursuing policy options which accommodate some of the more important and restrictive of these differences.

Principal examples of these policy options in Manitoba are:

- allowing the use of split tandems
- allowing for the use of 14-foot vehicle heights on key Manitoba routes.
- allowing for the effective use of air-suspension lift axles utilizing proper technological control devices.
- allowing for the un-inhibited use of relatively short wheelbase tractors which could be combined with 53-foot semitrailers within an overall length restriction of 65 feet, subject to acceptable safety performance (such vehicles are currently being permitted into Manitoba by being designated as non-RTAC vehicles).

- allowing for the use of any vehicle which complies with the requirements of U.S. Bridge Formula B, except: (1) any such vehicle deemed unacceptable from a safety standpoint; or (2) any such vehicle deemed unacceptable from a bridge loading standpoint.

Principal examples of these policy options in Mexico are:

- allowing the use of split tandems

- allowing for the use of 14-foot vehicle heights on key Federal highways

- allowing for the use of 53-foot trailers on major highways, using an appropriate standard king pin setting requirement in place of the somewhat restrictive 20.8-meter tractor-semitrailer length

- relaxing the tire pressure limit from the current 6 kgf/cm^2 (0.586 MPa or 85 psi) to accommodate the more typical tire pressure of 100 psi or more

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6.0 Concluding Remarks and Recommendations

The following are specific findings about trucking and TS&W regulations in the Mid-continent corridor:

6.1 TS&W Regulations

The corridor is governed by an extremely complex set of TS&W regulations emanating directly from the U.S. Federal Government, the nine corridor States, Mexico, Manitoba, and indirectly from other jurisdictions throughout North America.

This regulatory environment includes important differences on limits concerning tire loads, axle loads, gross vehicle weights, Bridge Formula requirements, vehicle heights, vehicle widths, semitrailer lengths, trailer lengths, and vehicle combination lengths. In addition, regulations vary in terms of the use of lift axles, split tandems, wide base tires, existence of air suspension systems, minimum tractor lengths, king pin settings, and a variety of other details. Together with the complexity of the regulations themselves is the wide variety of enforcement and permitting practices and policies relating to these regulations. The regulation limits provided in this environment range from some of the most restrictive to some of the most liberal in North America.

6.2 Truck Characteristics and Operations

These TS&W regulations have created a large and complex truck fleet with many different physical and operational characteristics. This fleet includes vehicles designed for "go anywhere" trucking to many types of special vehicles with unique body types, axle arrangements, and tire arrangements designed to optimize operations for specific commodities, origin-destination pairs, and truck routings. Much of this fleet and its activity is committed to relatively short, intrastate, or regional interstate hauls of little interest or consequence to national or international considerations.

6.3 Truck Flows

The largest movements of trucks in this corridor are between a few selected centers in the south, and east-west across the corridor on major Interstate highways. The actual amount of trucking that occurs within this corridor is minimal. There is very little trucking movement from places north of Kansas City to places south of Kansas City. This is demonstrated by, among other things, the fact that the lowest truck volumes in this corridor are at the two ends and in the middle.

6.4 Commodity Movements

Commodity movements in this corridor are dominated by intrastate movements. The vast majority of corridor-related interstate commodity movements are to and from, and across the corridor. Relatively little north-south interstate movement takes place through much of the corridor.

International movements are oriented towards the northeast and north central areas of the U.S. Very minimal activity occurs between Canada and Mexico via the Mid-continent corridor. Commodities moving between Mexico and the U.S. through Laredo are mainly oriented to the north central and northeast areas of the U.S. These commodities travel on I-35 through Dallas and on I-40 and I-44 towards the north and east. In the case of western Canadian traffic through Emerson, it is largely oriented on I-29 and I-94 towards the U.S. north central and northeast.

In many ways, because of the nature of the commodity movements associated with this corridor, TS&W policy options concerning States to the east and west of the corridor may be of much more importance than the differences in policies north-south within the corridor.

6.5 TS&W Policy Options for the Corridor

This research has outlined, compared and contrasted plausible near term TS&W policy options which may impact this corridor.

One way or another, TS&W regulations and policies will continue to change and to bring changes in trucking activity in the corridor. It is particularly useful to recognize that the idea of a status quo in TS&W policy means neither constant TS&W regulations nor constant consequence of those regulations. It may be argued that the change that is taking place within a status quo policy is itself much greater than the change that might be brought about by the policy options under consideration.

Much of the trucking in this corridor takes place well within the boundary conditions established by the TS&W regulations governing trucking in the corridor. As such, relaxation of these regulations can only be of real consequence in the near to medium term to mainly selected aspects of the total trucking activity. For example, low density commodities being moved in a 59-foot semitrailer within a five-axle tractor-semitrailer combination will have no interest in a increase of the tridem-axle and GVW limits relative to a six-axle tractor semitrailer. Bulk grain movements, on the other hand, will not be impacted by the Oberstar regulatory option regarding 53-foot semitrailers.

Many of the detailed regulatory differences that exist today relating to trucking in the Mid-continent corridor cannot be justified with any technical argument. There is good reason to pursue the harmonization and rationalization of TS&W regulatory differences of little or no technical significance to facilitate safer and more efficient trucking in the corridor.

6.6 Continuing Research Needs

TS&W policy considerations do not go away. This research shows that there are continuing needs to comprehend and communicate the complexity of the regulatory regime that exists within the corridor and its effects.

Issues of particular need of further research on TS&W policy for this corridor are:

- justification of the retention of non technically-based differences in the details of the TS&W regulations that apply in the corridor
- more extensive use of lift axles and wide base tires
- more extensive use of 57-foot or longer semitrailers
- a broader highway network for the use of long truck combinations operating within and to and from the corridor
- justification of the retention of Bridge Formula B limitations on 6-axle tractor semitrailers in light of the facts that: (1) Minnesota allows higher weights on these vehicles in the winter time; (2) North Dakota allows higher weights on these vehicles on non-IS highways year round; and (3) these vehicles are regularly employed in southern Texas on crossborder hauls

Additional References for the Thesis

1. Minnesota Department of Transportation. State of Minnesota Trunk Highway Traffic Volume Map. 1994.

2. Minnesota Department of Transportation. Trunk Highway Traffic Volumes, St. Paul-Minneapolis and Suburban Area. 1994.

3. Iowa Department of Transportation. Volume of Traffic on the Primary Road System. 1994.

4. Missouri Highway and Transportation Department, Planning Division. Missouri Commercial Vehicle Map. 1994.

5. Kansas Department of Transportation, Bureau of Transportation Planning. Vehicle Classification Count Summary. 1995.

6. Kansas Department of Transportation, Bureau of Transportation Planning. Traffic Flow Map, State Highway System of Kansas. 1994.

7. Oklahoma Department of Transportation, Planning Division. Oklahoma Traffic Characteristics. 1990.

8. Oklahoma Department of Transportation, Planning Division. Average Daily Traffic Volumes for the State Highway System. 1993.

9. Texas Department of Transportation. 1995 Vehicle Classification Report. 1996.

10. North Dakota 1994 Traffic Report

11. South Dakota Traffic Flow Map (1994)

12. State of Nebraska. Traffic Flow Map of the State Highways. 1995

APPENDIX A

United States Road Network

Figure A-1

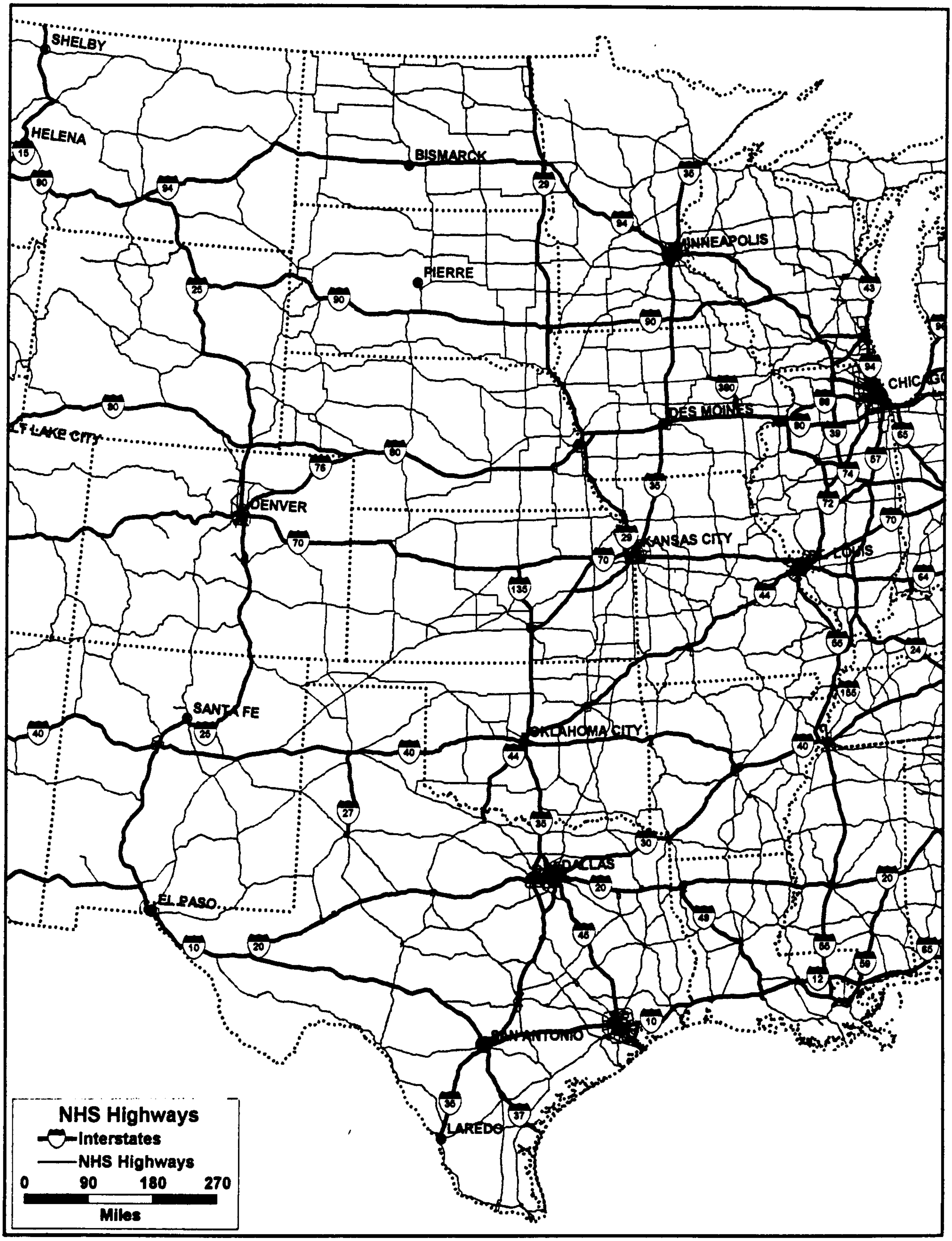
Interstate Highways in the Study Region

Source: NHPN GIS Data, 1995

November, 1996 - UMTIG©

Figure A-2

NHS Highways in the Study Region

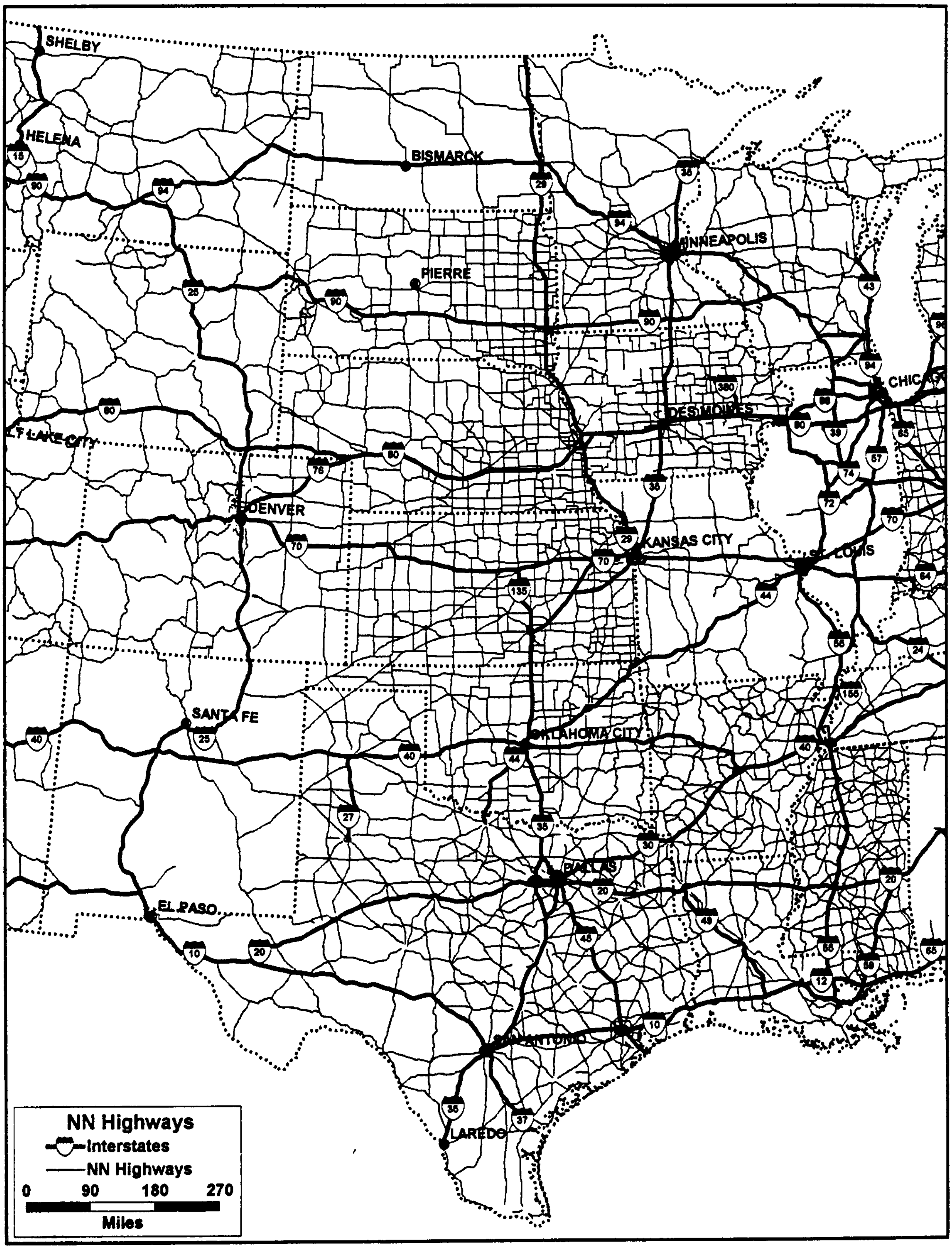


Source: NHPN GIS Data, 1995

November, 1996 - UMTIG©

Figure A-3

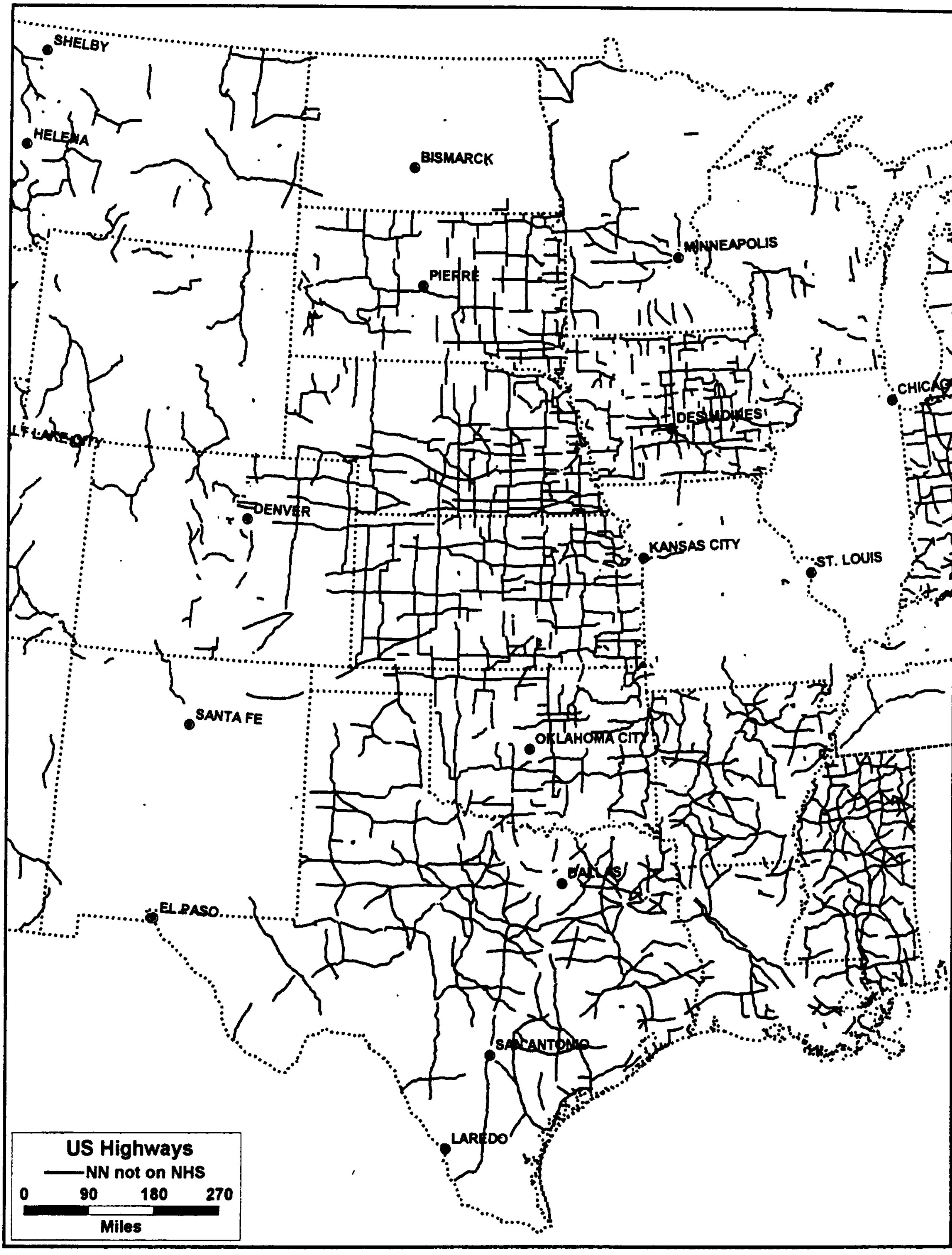
NN Highways in the Study Region



Source: NHPN GIS Data, 1995

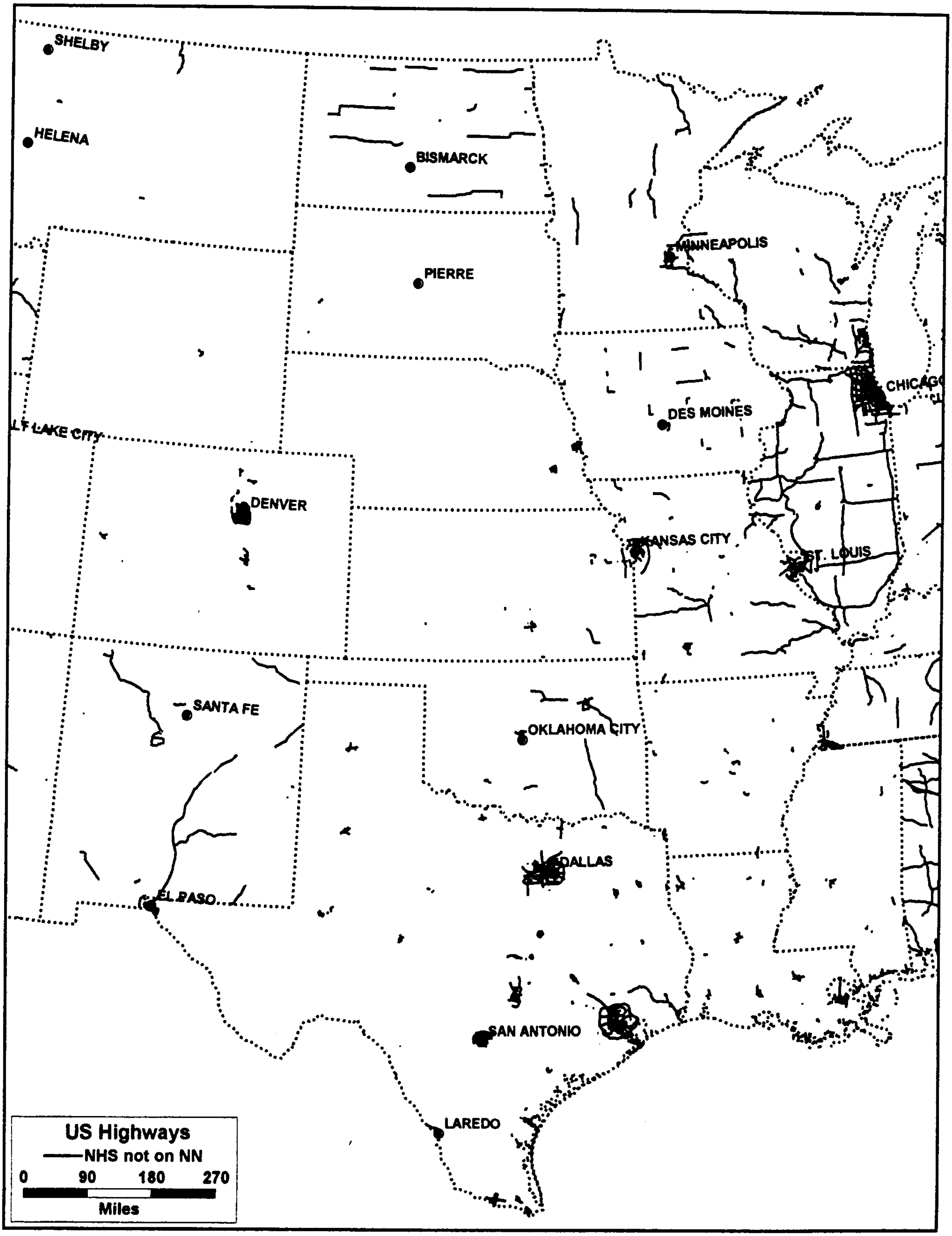
November, 1996 - UMTIG©

Figure A-4
NN not NHS Highways in the Study Region



Source: NHPN GIS Data, 1995 and UMTIG

Figure A-5
NHS not NN Highways in the Study Region



Source: NHPN GIS Data, 1995

APPENDIX B

Truck Flows in the Mid-Continent Corridor

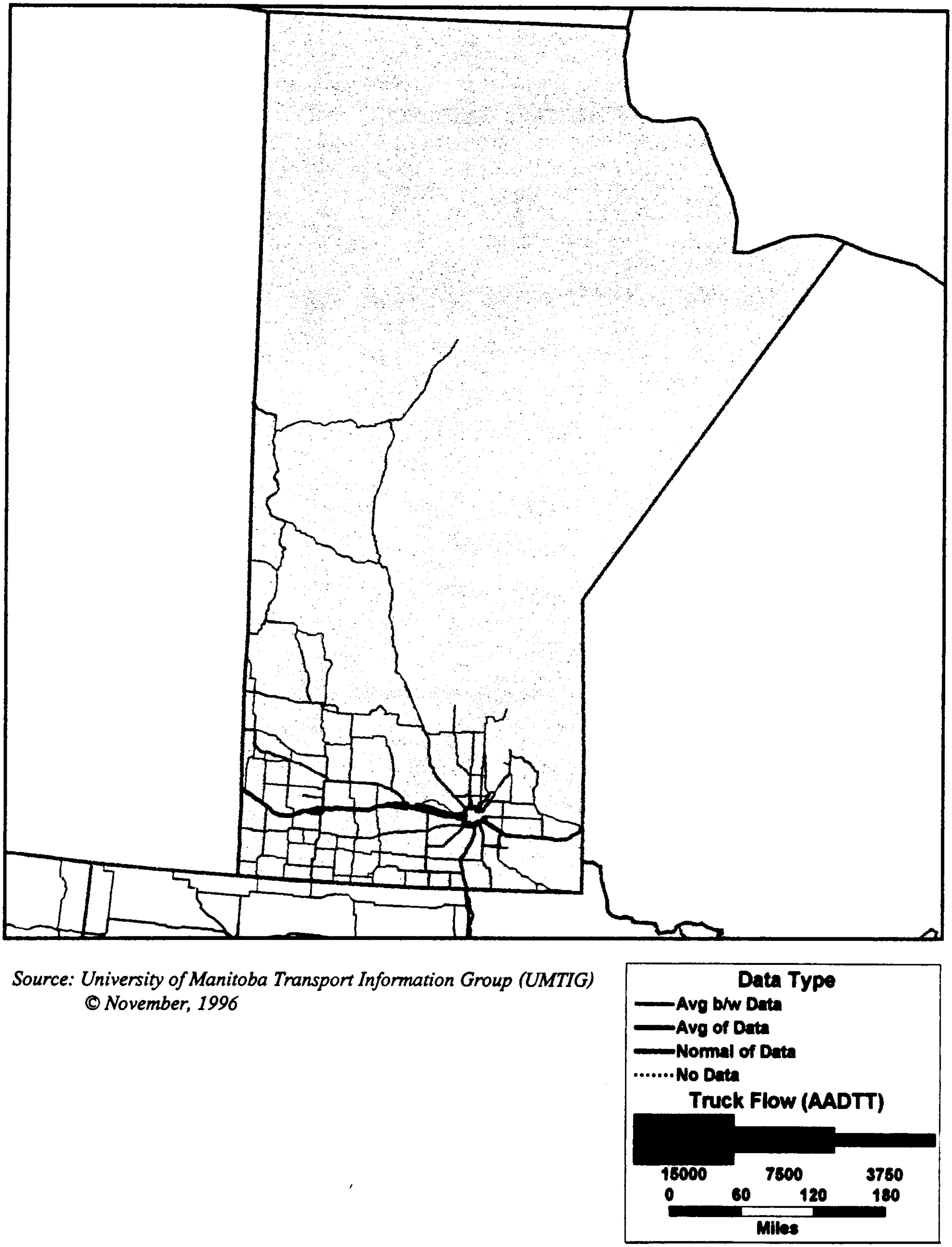
Truck Flows in the Mid-continent Corridor

The nine corridor States provided commercial vehicle volume information on the State highway network. Each of the source data sets is unique in terms of:

- the year of the data set
- whether the data is point data or flow data
- whether the data relates to all trucks or a portion of all trucks
- whether the data is given as "trucks as a percent of another traffic measure" (*i.e.* average annual daily traffic) or as an absolute number
- whether the data applies to all days or weekdays
- the "density" of the database

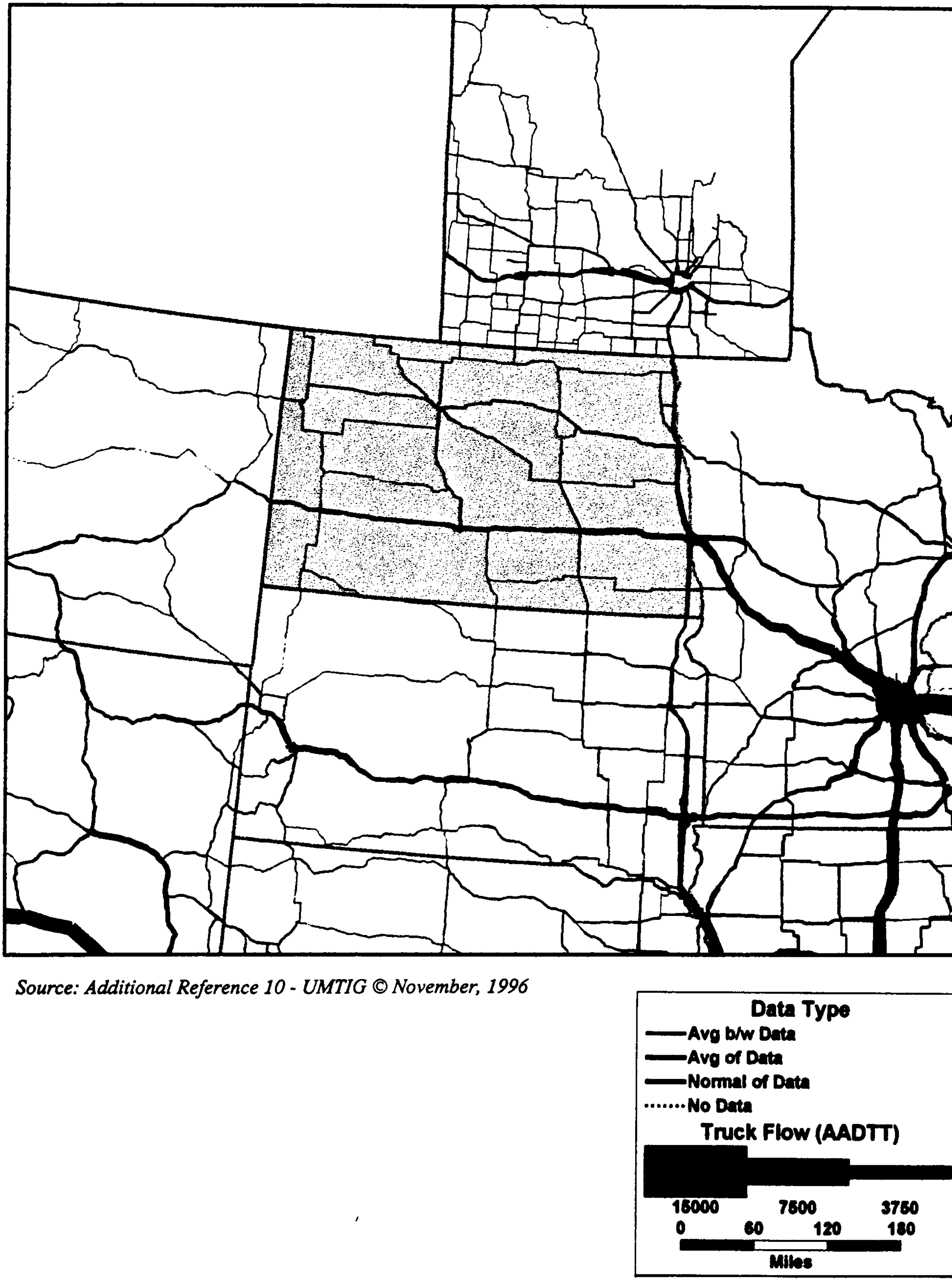
The figures in the following pages show truck flow maps for Manitoba and for the States of North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Missouri, Kansas, Oklahoma and Texas.

Figure B-1
Heavy Commercial Vehicle Flows in Manitoba



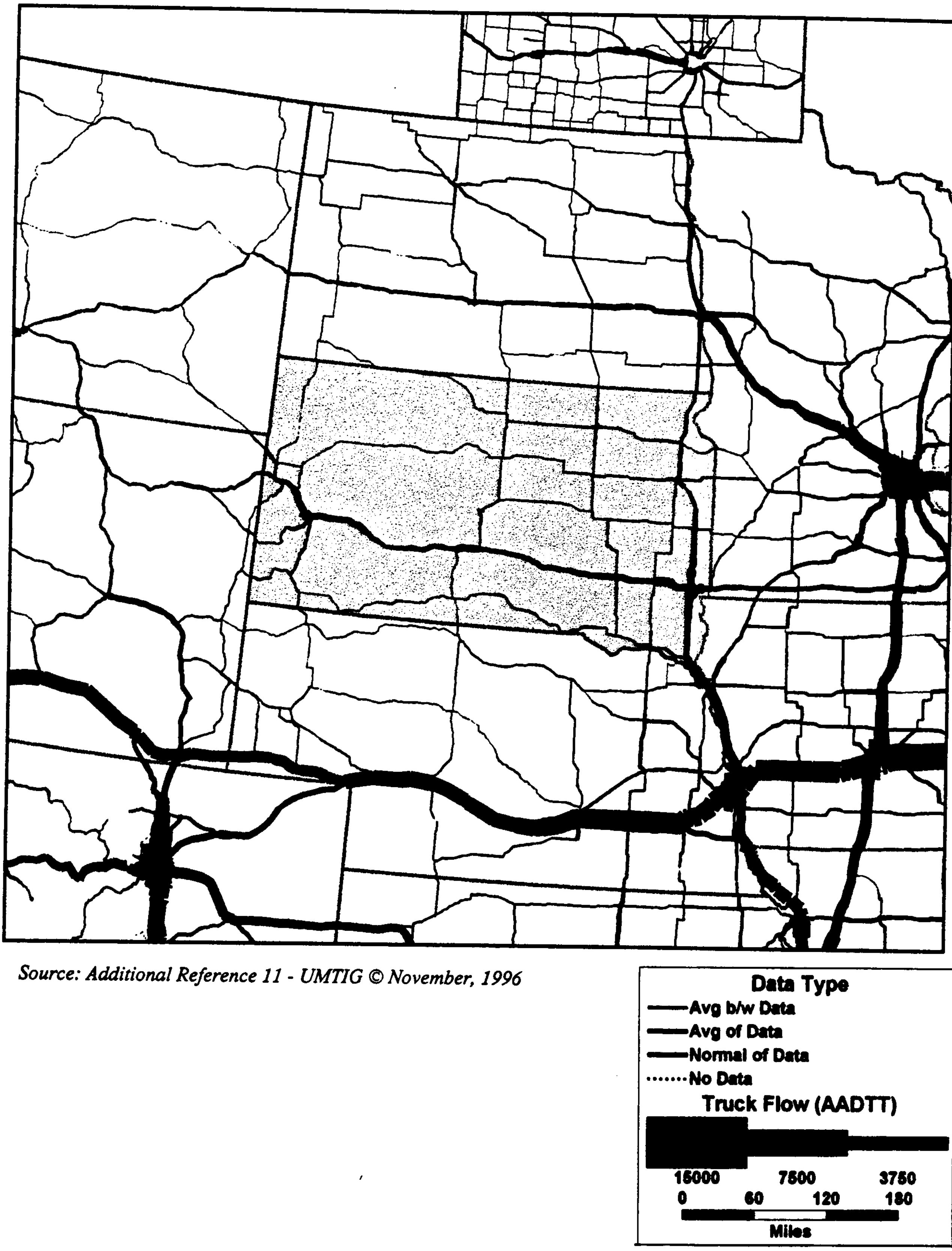
Source: University of Manitoba Transport Information Group (UMTIG)
© November, 1996

Figure B-2
Heavy Commercial Vehicle Flows in North Dakota



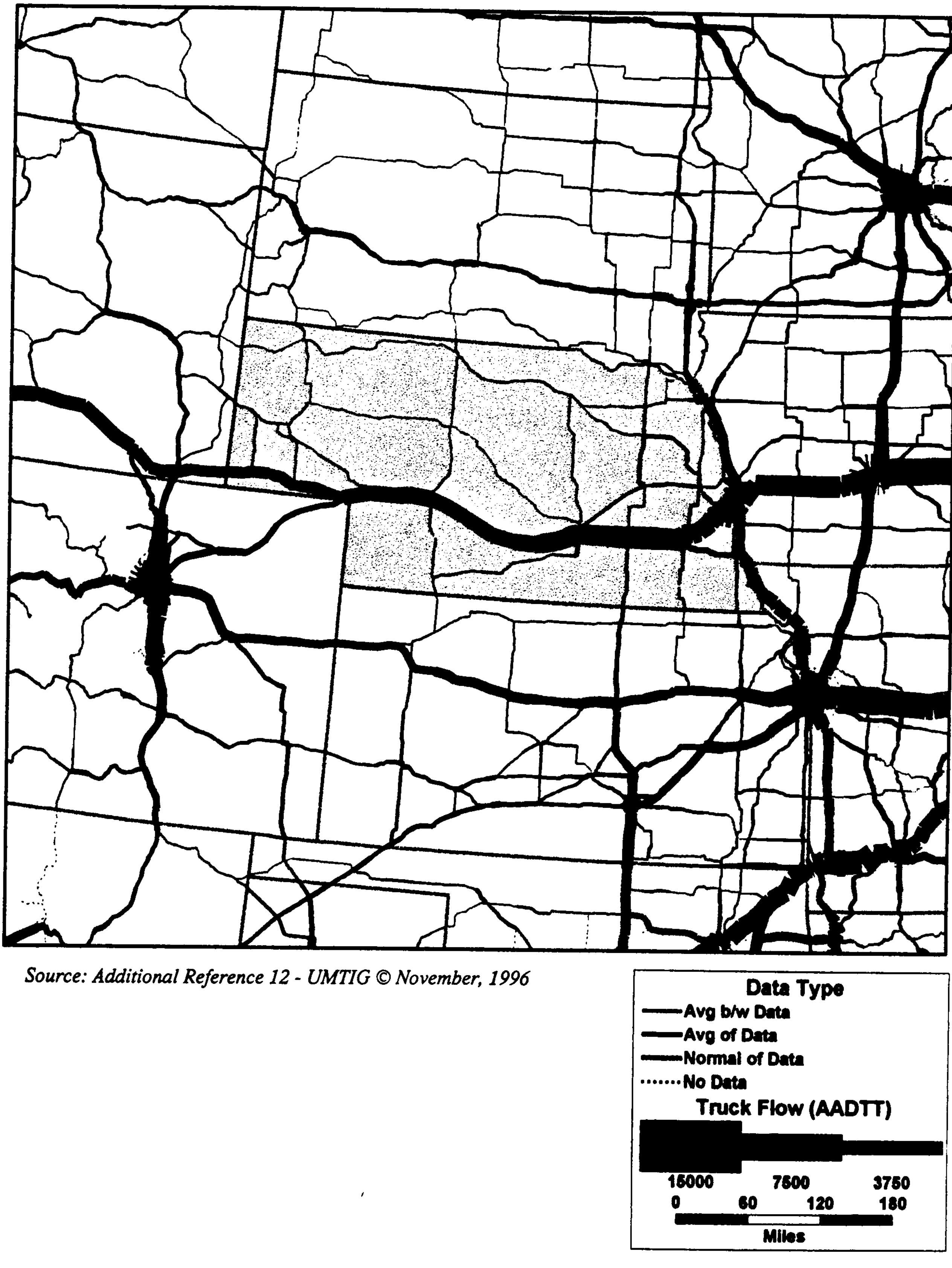
Source: Additional Reference 10 - UMTIG © November, 1996

Figure B-3
Heavy Commercial Vehicle Flows in South Dakota



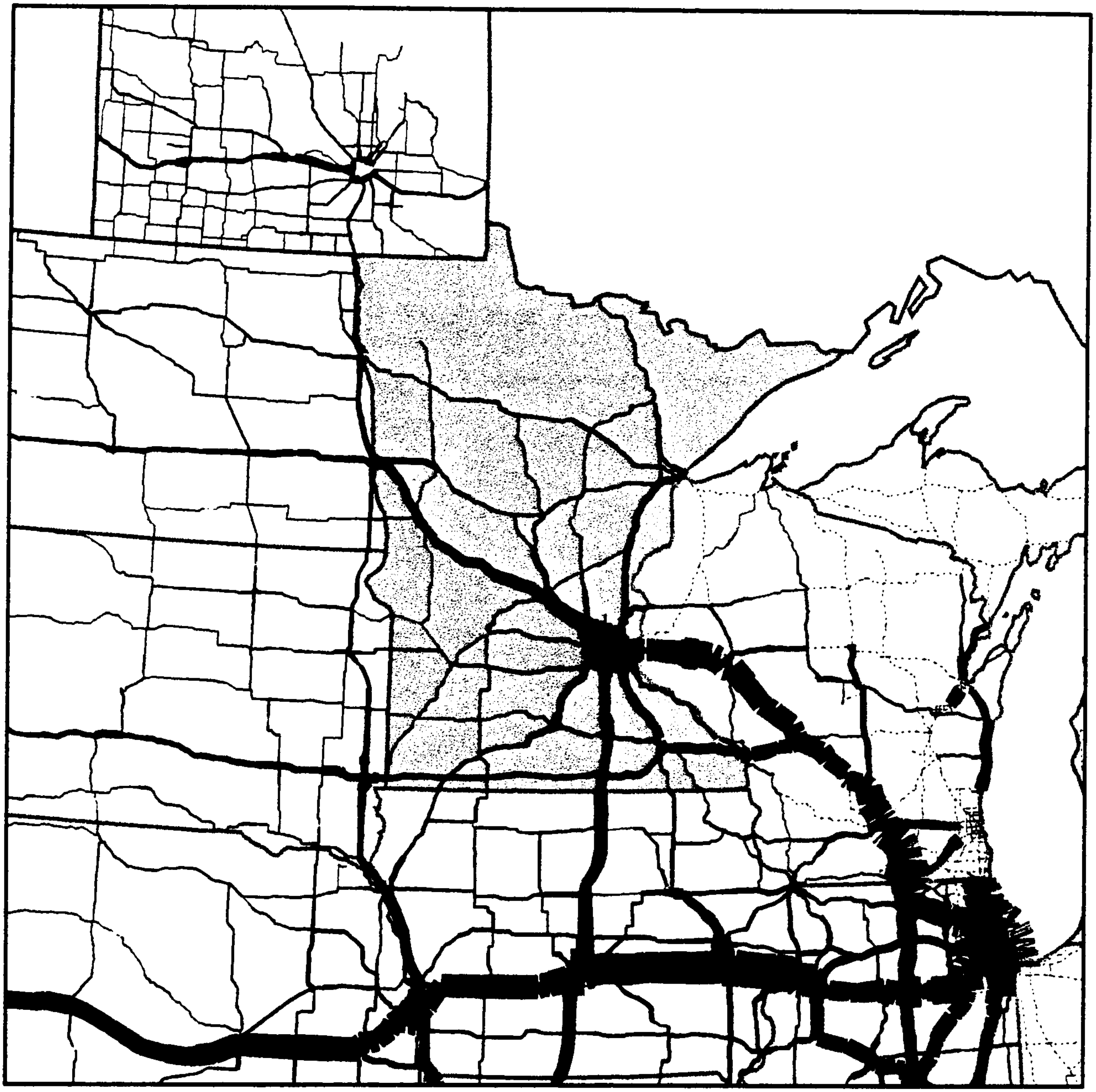
Source: Additional Reference 11 - UMTIG © November, 1996

Figure B-4
Heavy Commercial Vehicle Flows in Nebraska



Source: Additional Reference 12 - UMTIG © November, 1996

Figure B-5
Heavy Commercial Vehicle Flows in Minnesota



Source: Additional References 1 and 2 - UMTIG © November, 1996

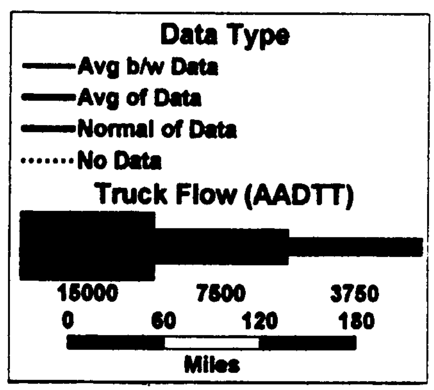
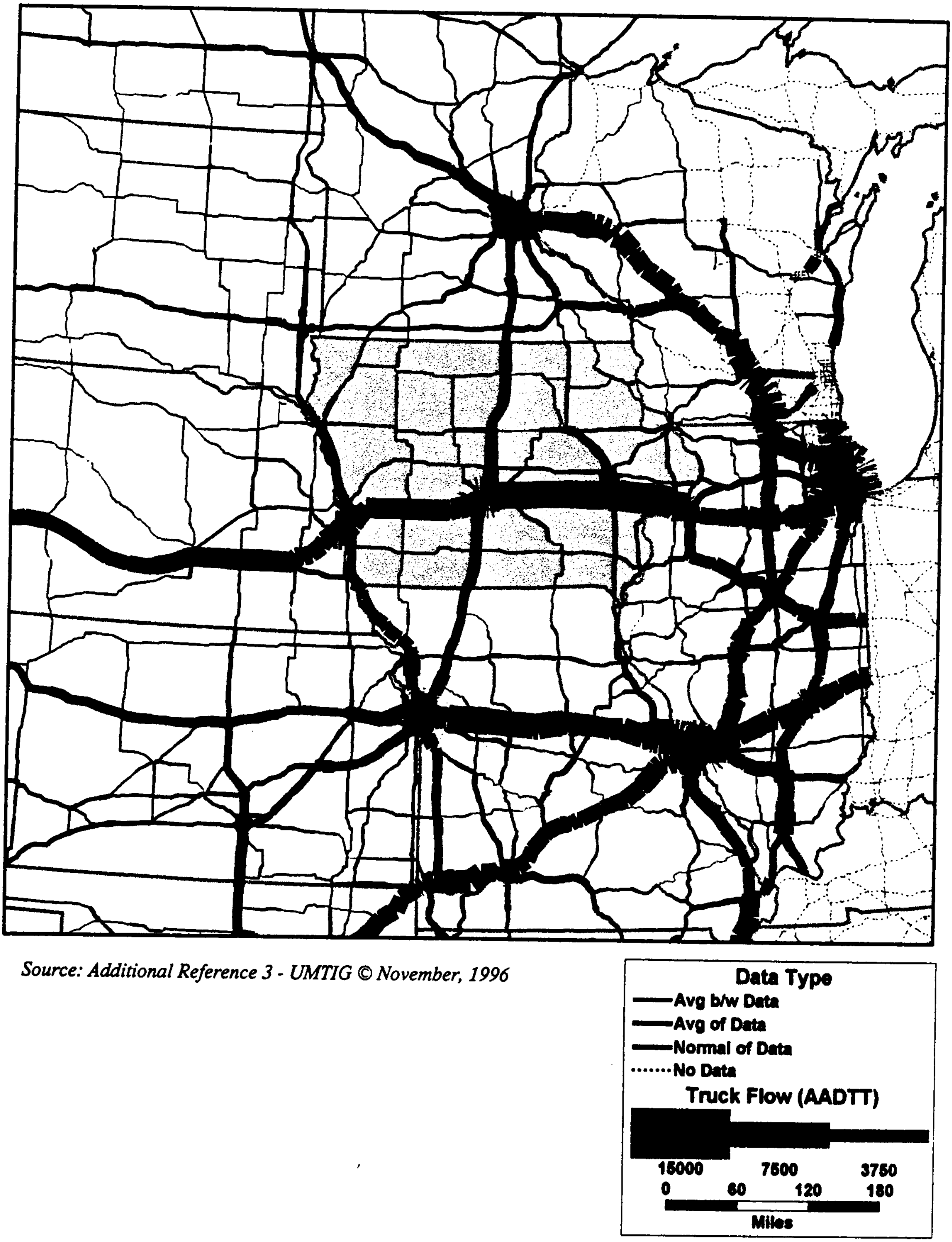
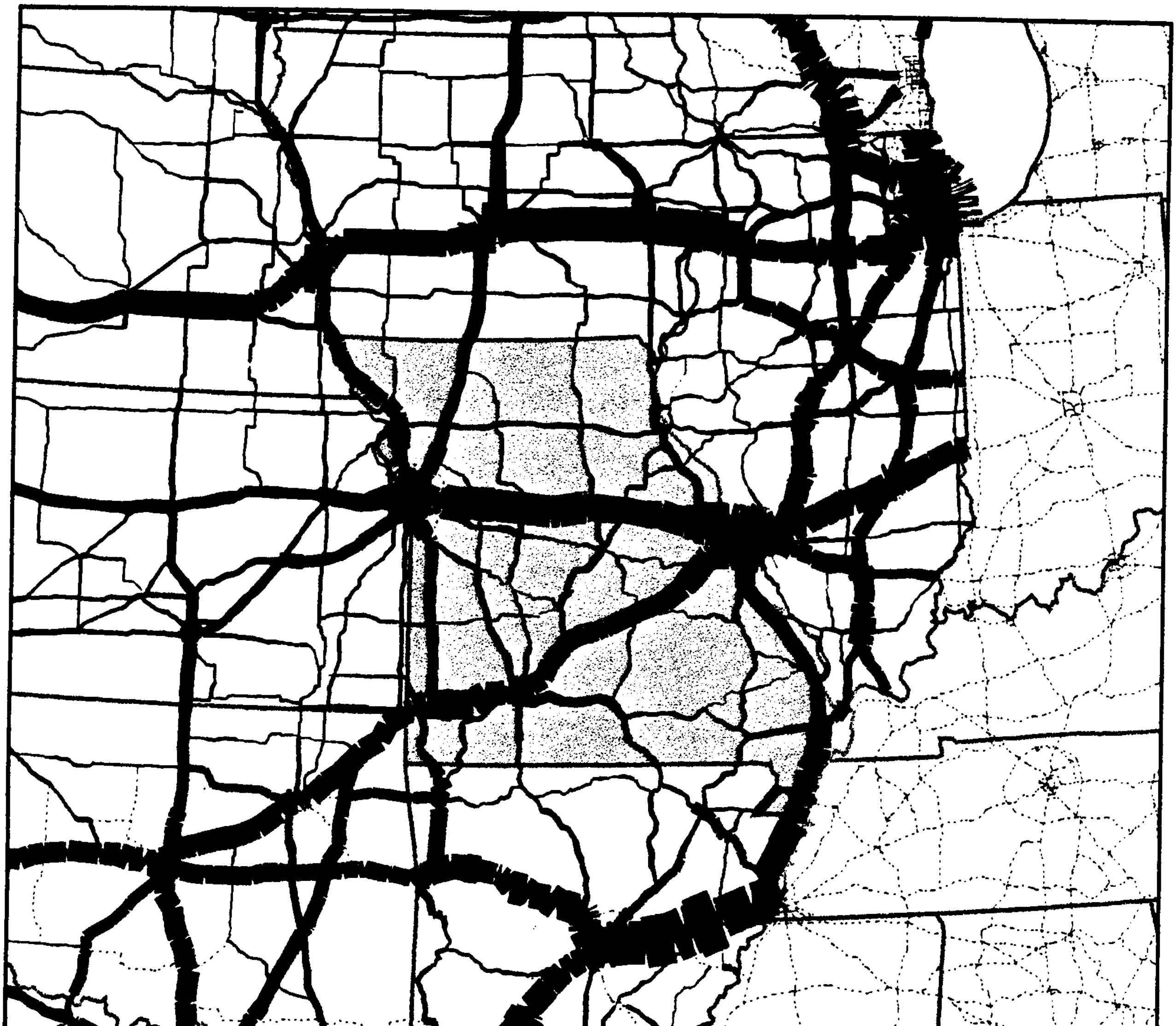


Figure B-6
Heavy Commercial Vehicle Flows in Iowa



Source: Additional Reference 3 - UMTIG © November, 1996

Figure B-7
Heavy Commercial Vehicle Flows in Missouri



Source: Additional Reference 4 - UMTIG © November, 1996

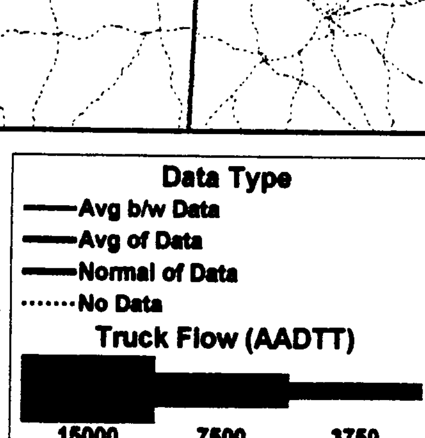
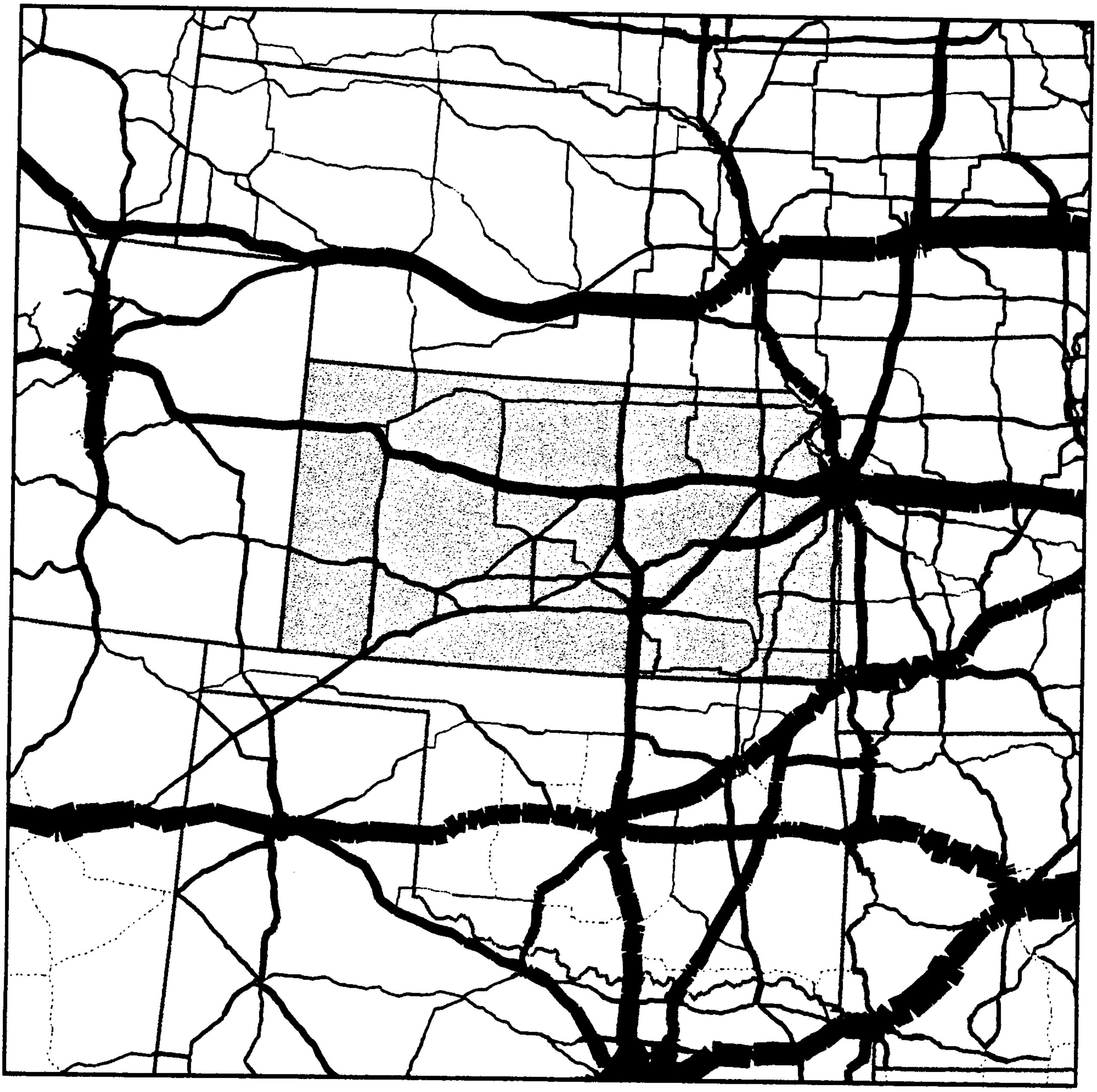


Figure B-8
Heavy Commercial Vehicle Flows in Kansas



Source: Additional References 5 and 6 - UMTIG © November, 1996

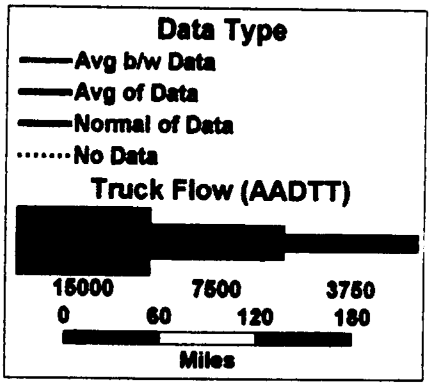
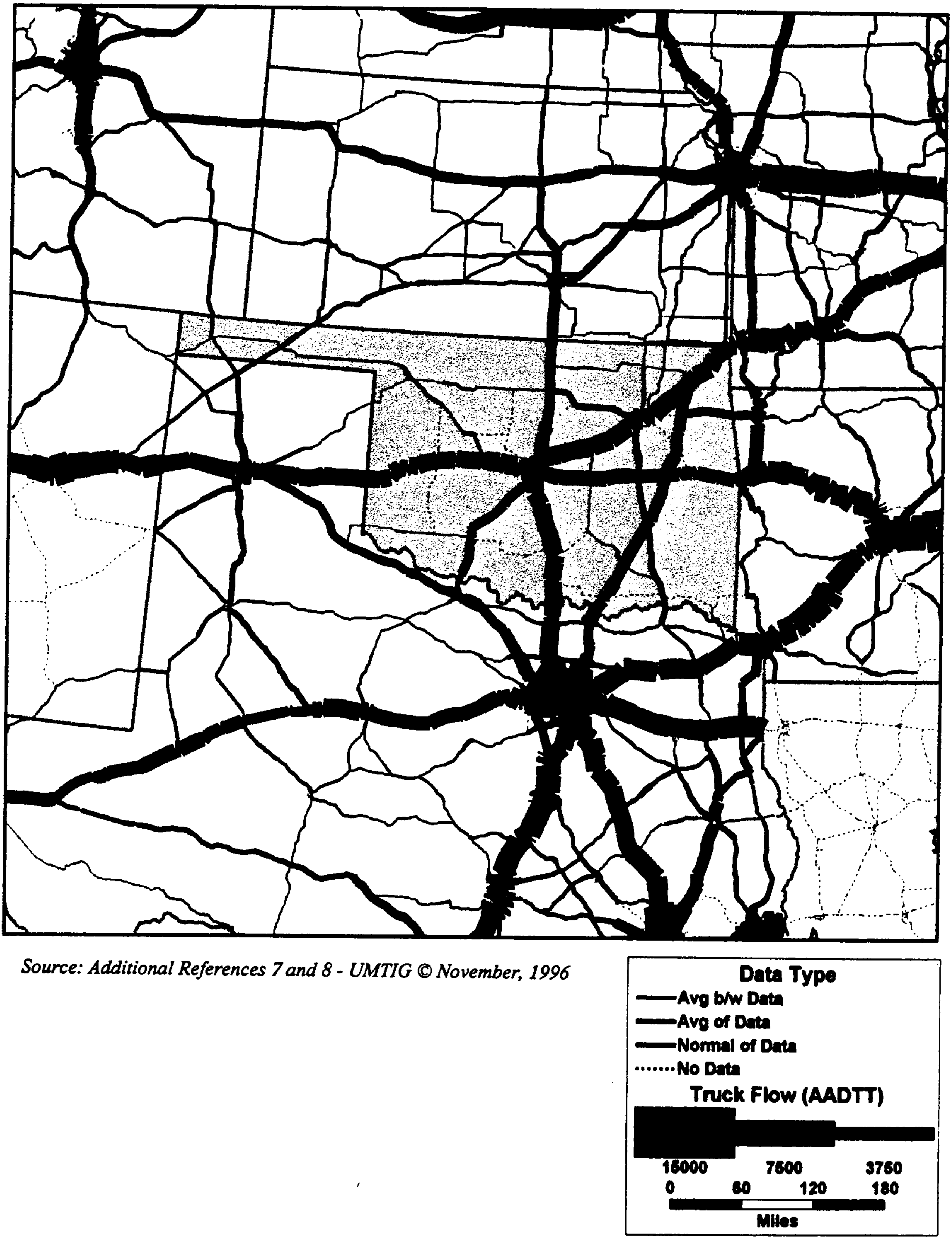
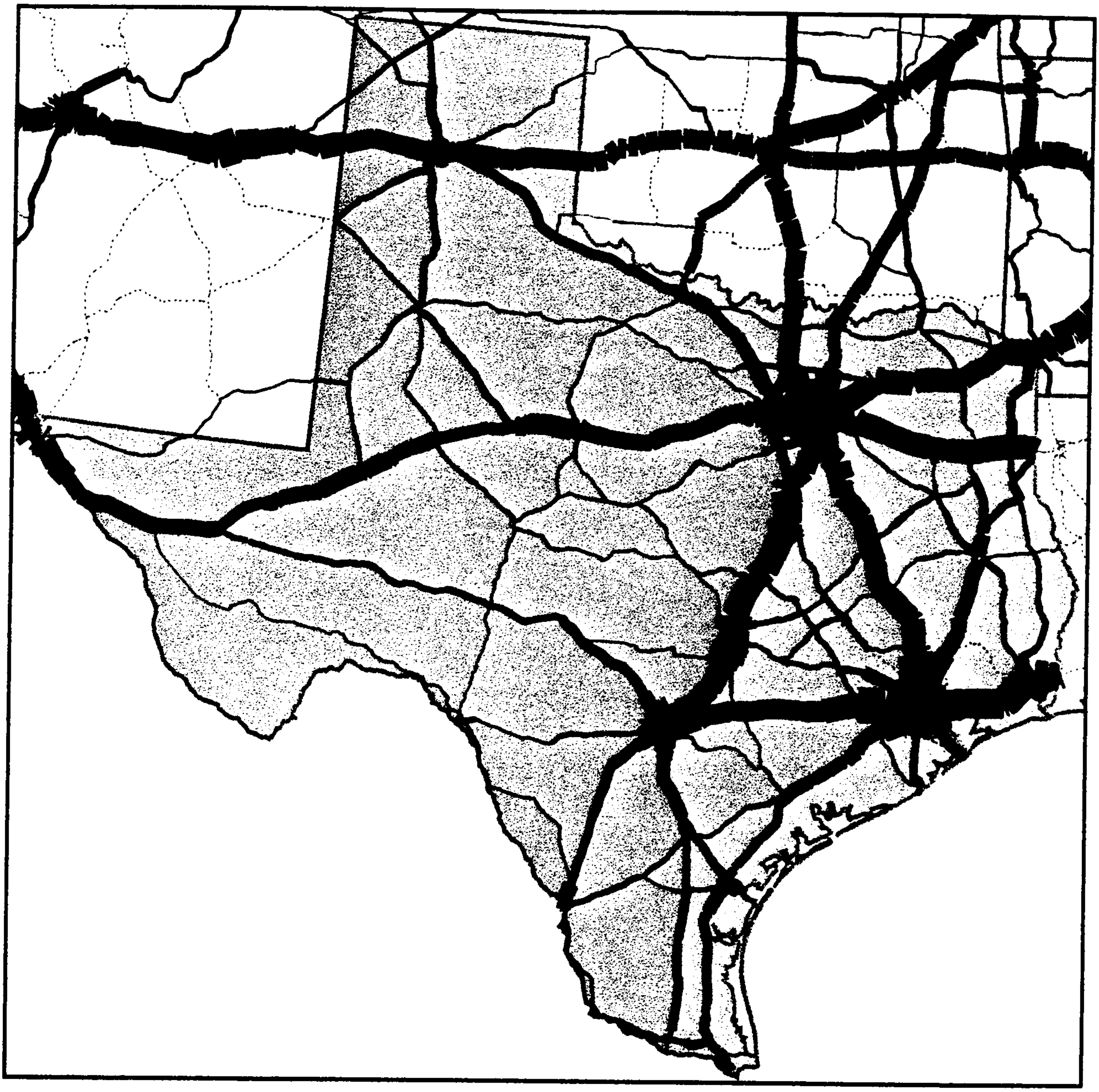


Figure B-9
Heavy Commercial Vehicle Flows in Oklahoma

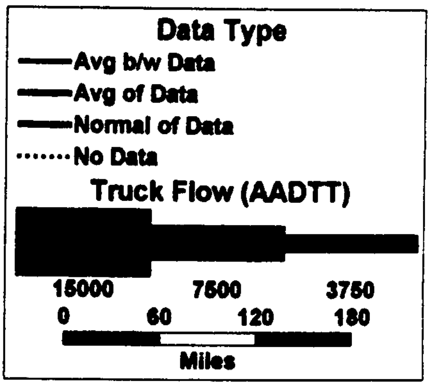


Source: Additional References 7 and 8 - UMTIG © November, 1996

Figure B-10
Heavy Commercial Vehicle Flows in Texas



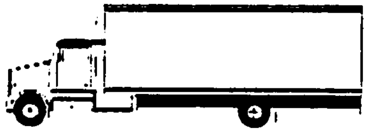
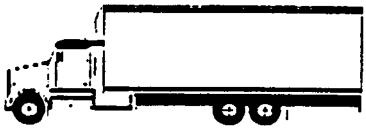
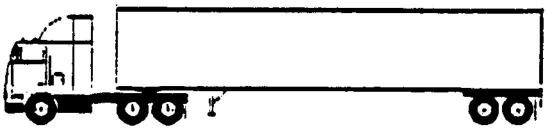
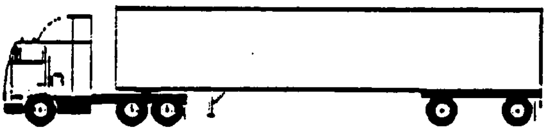
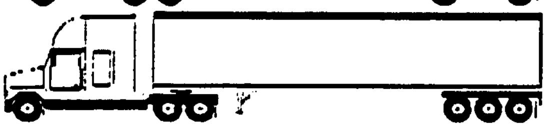
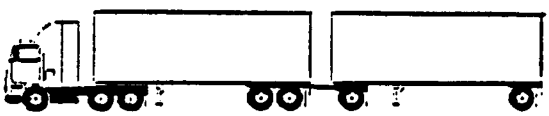
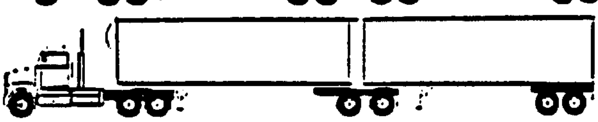
Source: Additional Reference 9 - UMTIG © November, 1996



APPENDIX C

State Classification Data

Truck Configurations Used in This Research

Vehicle Configuration	
	2-axle Straight
	3-axle Straight
	3-S2
	3-S2 with Split Tandem
	3-S3
	2-S1-2
	3-S1-2
	3-S2-2
	3-S2-3
	3-S2-4
	3-S2-S2 (B-train)
	3-S3-S2 (Super B-train)

State Classification Data

This appendix discusses relevant information about State classification data for the corridor States. The data concerns operations on the I-29 and I-35. Data were available for South Dakota, Iowa, Kansas, Oklahoma and Texas.

South Dakota [Chapter 3--Ref. 2, p 4-9]

Figure C-1 illustrates the location of counters where State classification data collection takes place in South Dakota. Data are available at 12 classification locations on the I-29 in South Dakota--9 at rural sites and 3 at urban sites. Two sites, which are shown in Table C-1, illustrate the full range of vehicle classifications along this route. Site 2--north of State highway 15--is the location with the smallest proportion of straight axle trucks (11.71 percent of the observed fleet). Site 11--located north of Exit 4--is the location with the largest proportion of straight axle trucks (22.14 percent of the observed fleet).

Table C-1

Major Vehicle Classification Locations on I-29 in South Dakota

(Percent of the observed fleet)

Vehicle Class	Vehicle Configuration	Site 2	Site 11
4,5,6	2/3-axle	11.22	22.14
7	4/5-axle	0.49	1.66
8	2-S1/S2	29.27	12.59
9	3-S2	54.84	48.19
10	3-S3/tr + tr	2.15	10.13
11	2-S1-2 *	1.79	5.28
12	3-S1-2 *		
13	other doubles *		
14	unclassified	none	none
Total		99.76	99.99

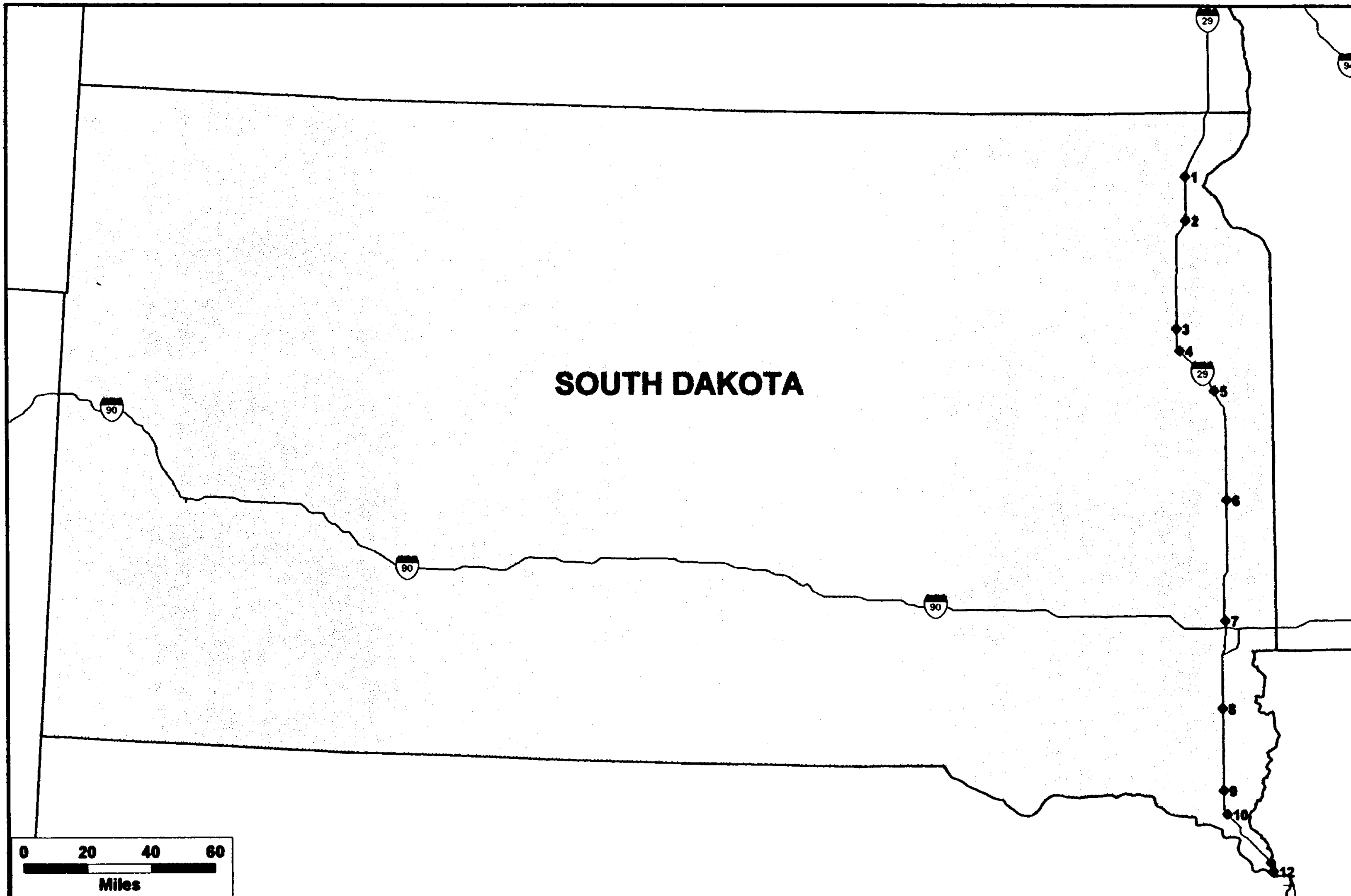
Source: Volume of Traffic on the Primary Road System - South Dakota, 1995

* The sum of classes 11, 12 and 13 totals 1.79 and 5.28 percent for Site 2 and 11 respectively

Site 2 North of State Highway 15

Site 11 North of Exit 4

Figure C-1
Locations of State Classification Data on I-29 in South Dakota



Source: Vehicle Classification Count Summary from South Dakota

- Five-axle tractor-semitrailers dominate, accounting for between 48 and 55 percent of the observed fleet at the two locations.

- Double trailer combinations account for between 2 and 5 percent of the observed fleet at the two locations.

- Six-axle tractor-semitrailers and truck + trailer account for between 2 and 10 percent of the observed fleet at the two locations.

Iowa [Chapter 3--Ref. 2, p 4-11]

Figures C-2-a to C-2-f illustrate the location of State classification data collection on the I-29 and the I-35 in Iowa.

Data are available at 43 classification locations on the I-29 in Iowa--24 at rural sites and 19 at urban sites. Two sites, which are shown in Table C-2, illustrate the full range of vehicle classifications along this route. Site 17--at the Nebraska street and Pierce street interchange--is the location with the largest proportion of straight axle trucks (26.35 percent of the observed fleet). Site 55--located north of the Missouri-Iowa State line--is the location with the smallest proportion of straight axle trucks (9.19 percent of the observed fleet).

Table C-2

Major Vehicle Classification Locations on I-29 in Iowa

(Percent of the observed fleet)

Vehicle Class	Vehicle Configuration	Site 17	Site 55
4,5,6	2/3-axle	25.09	8.84
7	4/5-axle	1.26	0.34
8	2-S1/S2	11.66	19.18
9	3-S2	55.71	63.44
10	3-S3/tr + tr	1.34	1.94
11	2-S1-2 *	4.98	5.25
12	3-S1-2 *		
13	other doubles *		
14	unclassified	none	none
Total		100.04	98.99

Source: Volume of Traffic on the Primary Road System - Iowa, 1994

* The sum of classes 11, 12 and 13 totals 4.98 and 5.25 percent for Site 17 and 55 respectively

Site 17 at Nebraska street and Pierce street Interchange Site 55 North of the Missouri-Iowa State line

Figure C-2-a

Locations of State Classification Data for I-29 and I-35 in Iowa

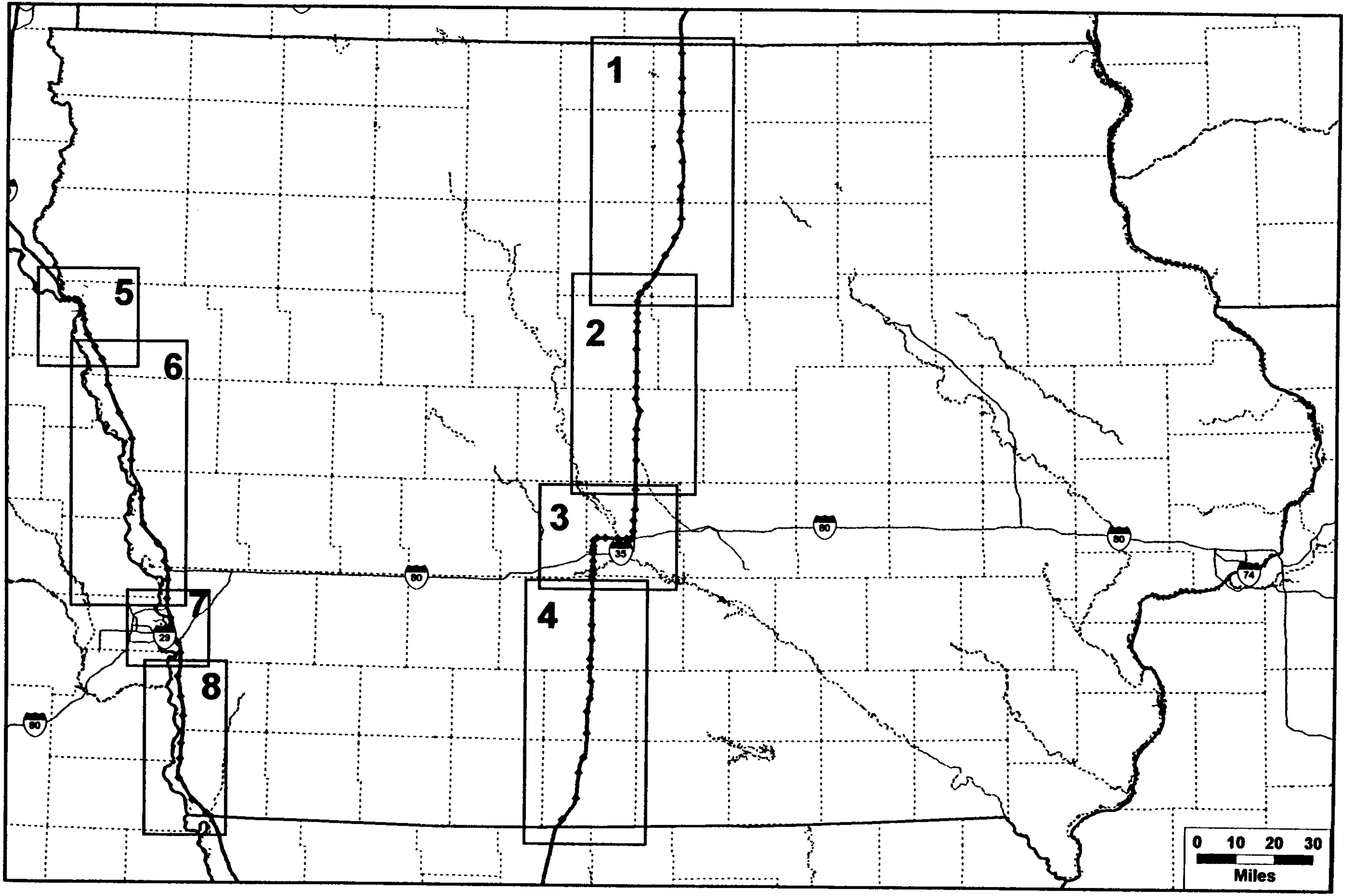


Figure C-2-b

Locations of State Classification Data in Sections five and six in Iowa

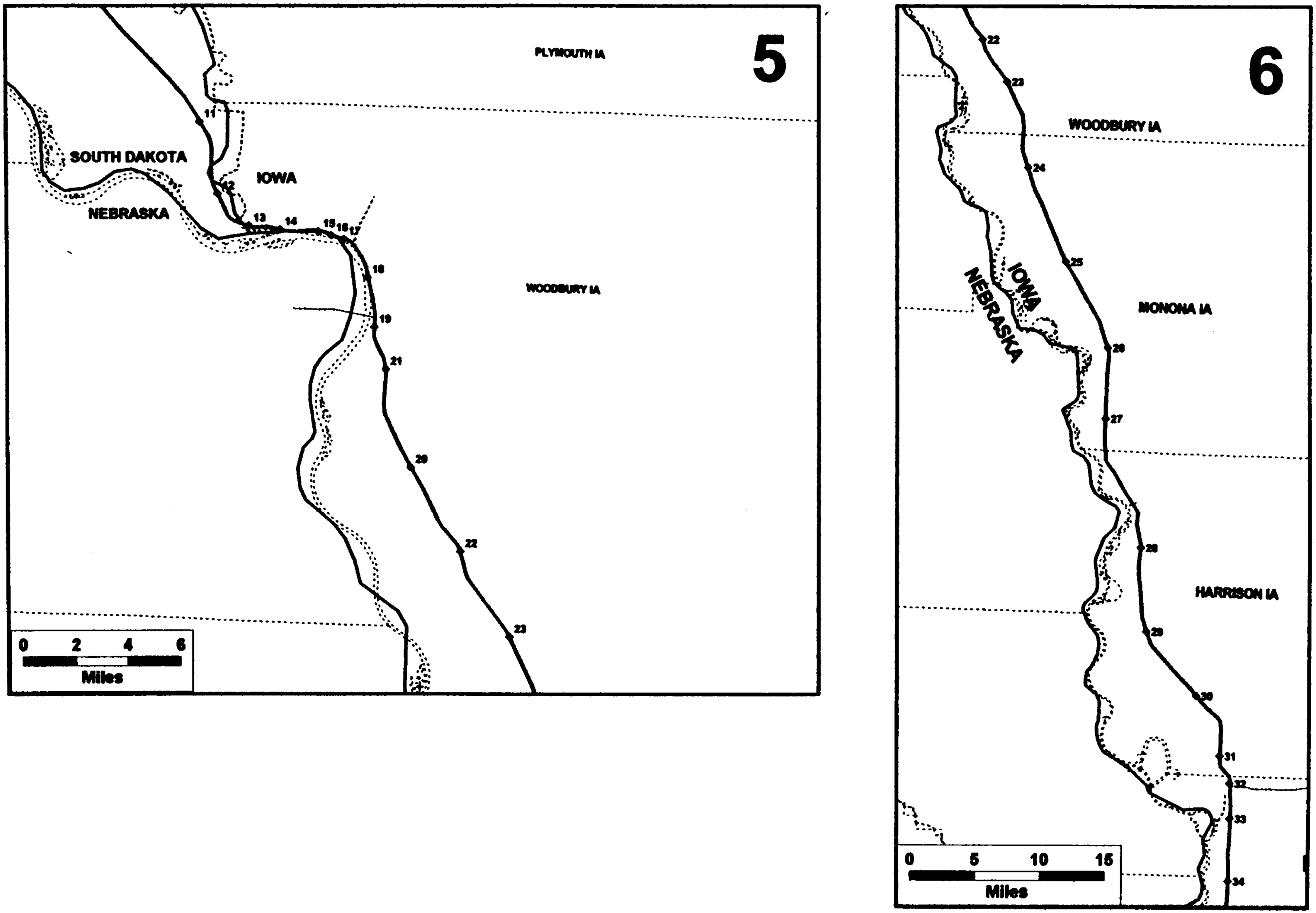
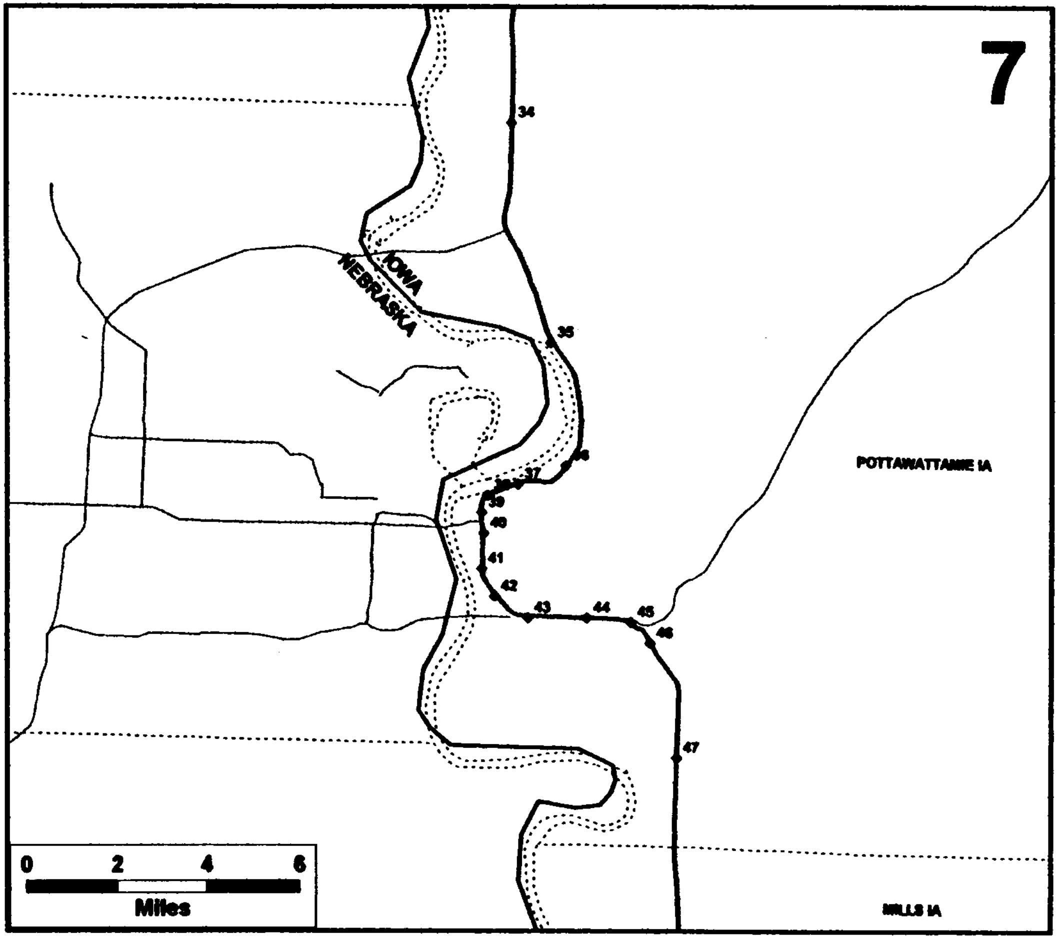
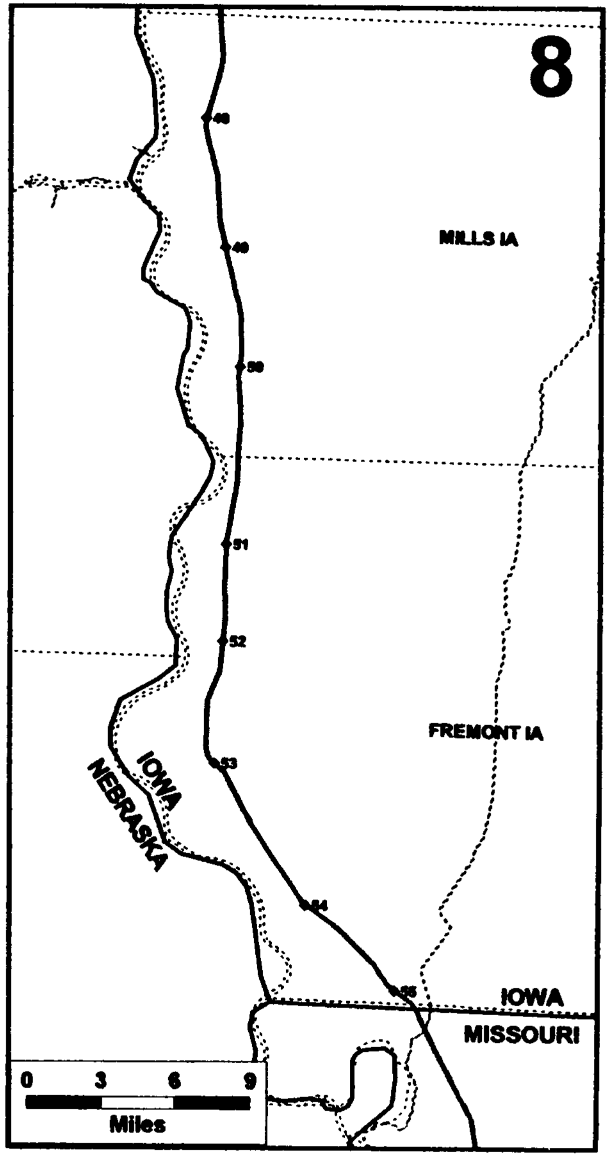


Figure C-2-c

Locations of State Classification Data in Sections seven and eight in Iowa





- Five-axle tractor-semitrailers dominate, accounting for between 56 and 63 percent of the observed fleet at the two locations.

- Double trailer combinations account for about 5 percent of the observed fleet at the two locations.

- 3/4-axle tractor semitrailers account for about 12 percent of the observed fleet in urban areas and for almost 20 precent of the fleet in rural areas.

- Six-axle tractor-semitrailers and truck + trailer account for between 1.34 and 1.94 percent of the observed fleet at the two locations.

Figures C-2-d to C-2-f show the locations of State data collection on I-35 in Iowa. Data are available at 57 classification locations on the I-35 in Iowa--48 at rural sites and 9 at urban sites. Two sites, which are shown in Table C-3, illustrate the full range of vehicle classification along this route. Site 42--on the Des Moines bypass--is the location with the largest proportion of straight axle trucks (26.18 percent of the observed fleet). Site 57--on the Iowa-Missouri border--is the location with the smallest proportion of straight axle trucks (11.89 percent of the observed fleet).

Table C-3

Major Vehicle Classification Locations on I-35 in Iowa

(Percent of the observed fleet)

Vehicle Class	**Vehicle Configuration**	**Site 42**	**Site 57**
4,5,6	2/3-axle	25.15	11.44
7	4/5-axle	1.03	0.45
8	2-S1/S2	15.58	18.57
9	3-S2	51.58	61.52
10	3-S3/tr + tr	1.59	1.88
11	2-S1-2 *	5.08	6.06
12	3-S1-2 *		
13	other doubles *		
14	unclassified	none	none
Total		100.01	99.92

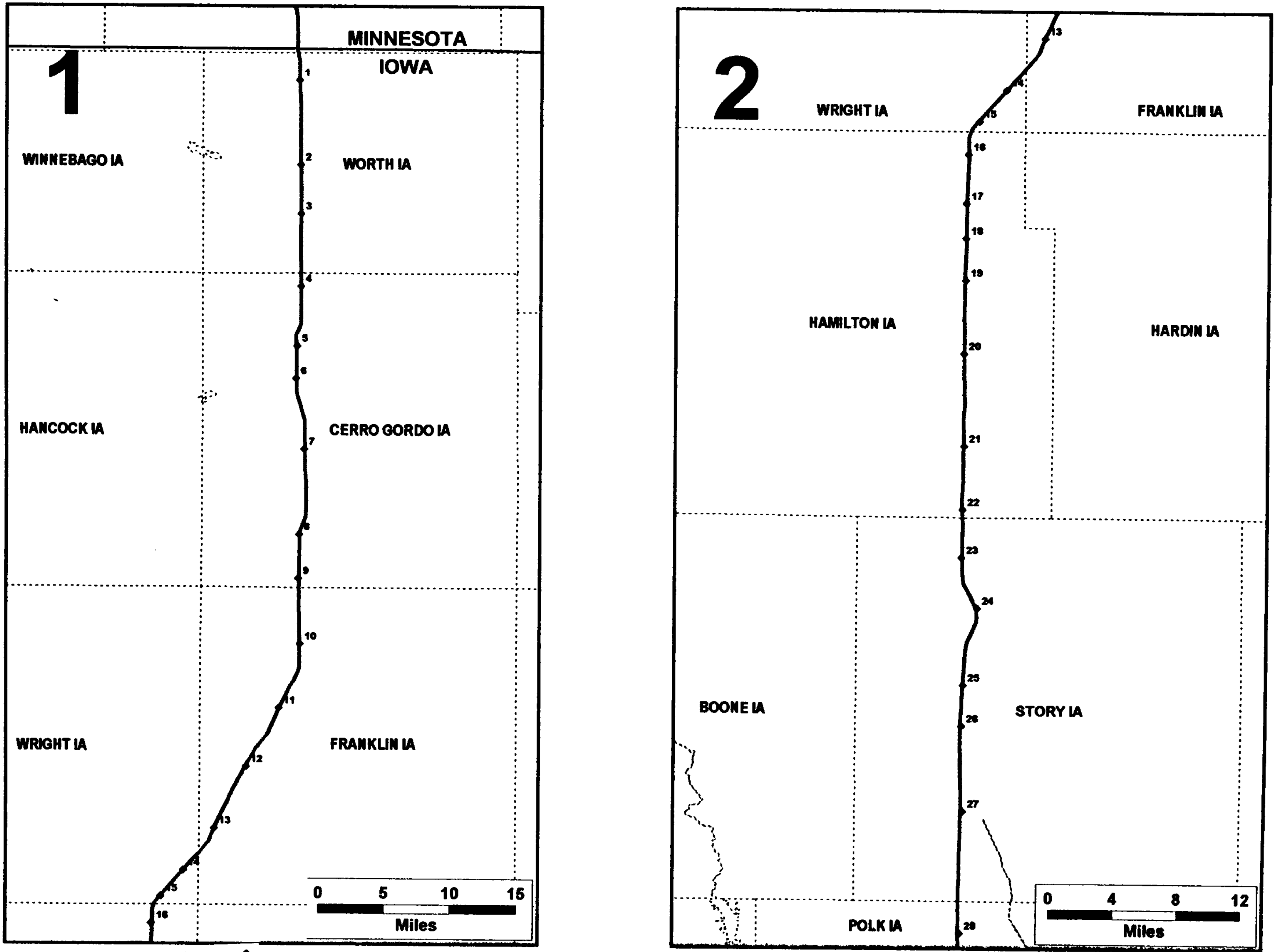
Source: Volume of Traffic on the Primary Road System - Iowa, 1994

* The sum of classes 11, 12 and 13 totals 5.08 and 6.06 percent for Site 42 and 57 respectively

site 42 At the Des Moines bypass site 57 At the Iowa-Missouri border

Figure C-2-d

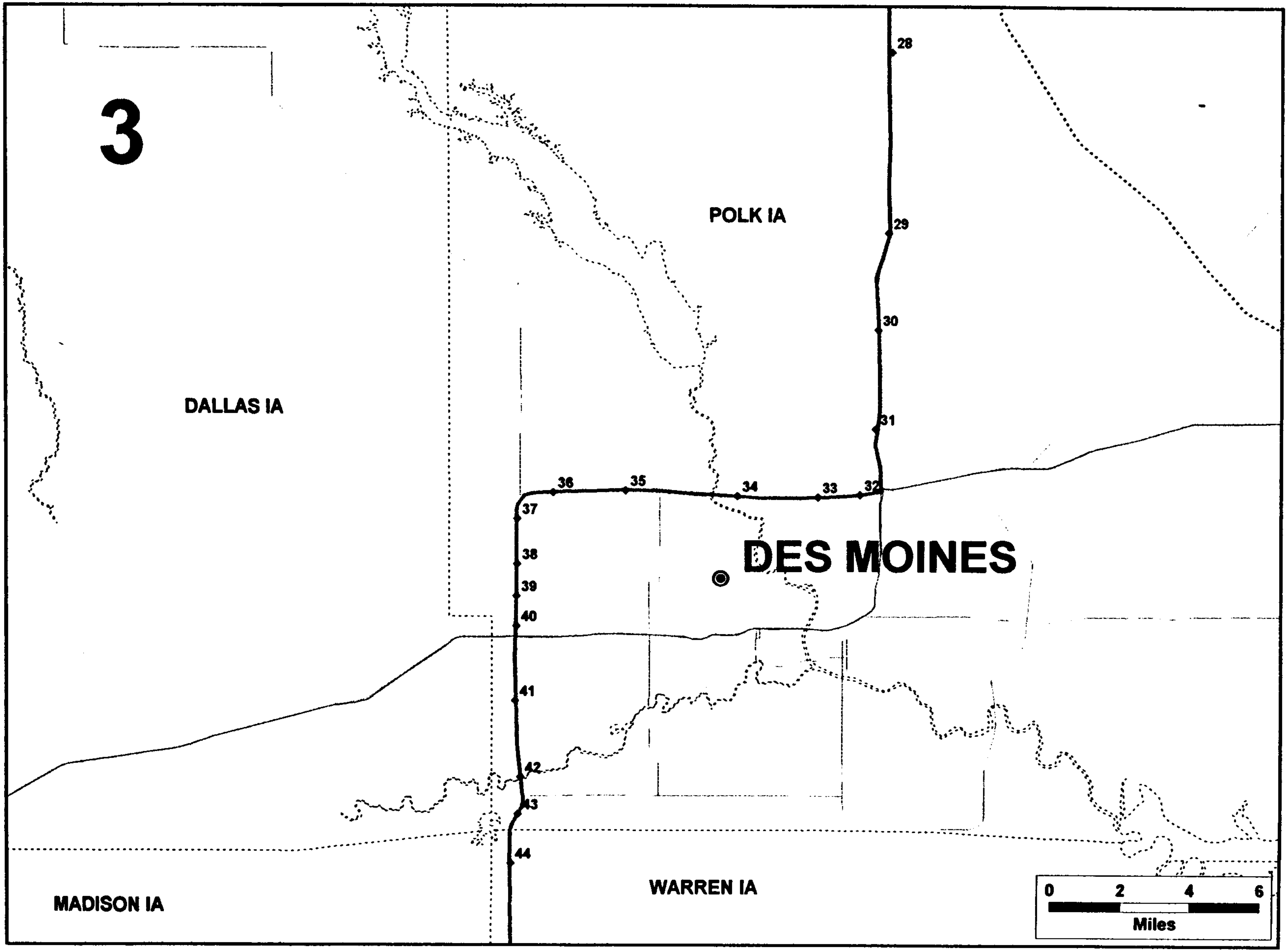
Locations of State Classification Data in Sections one and two in Iowa



Source: Additional Reference 3

Figure C-2-e

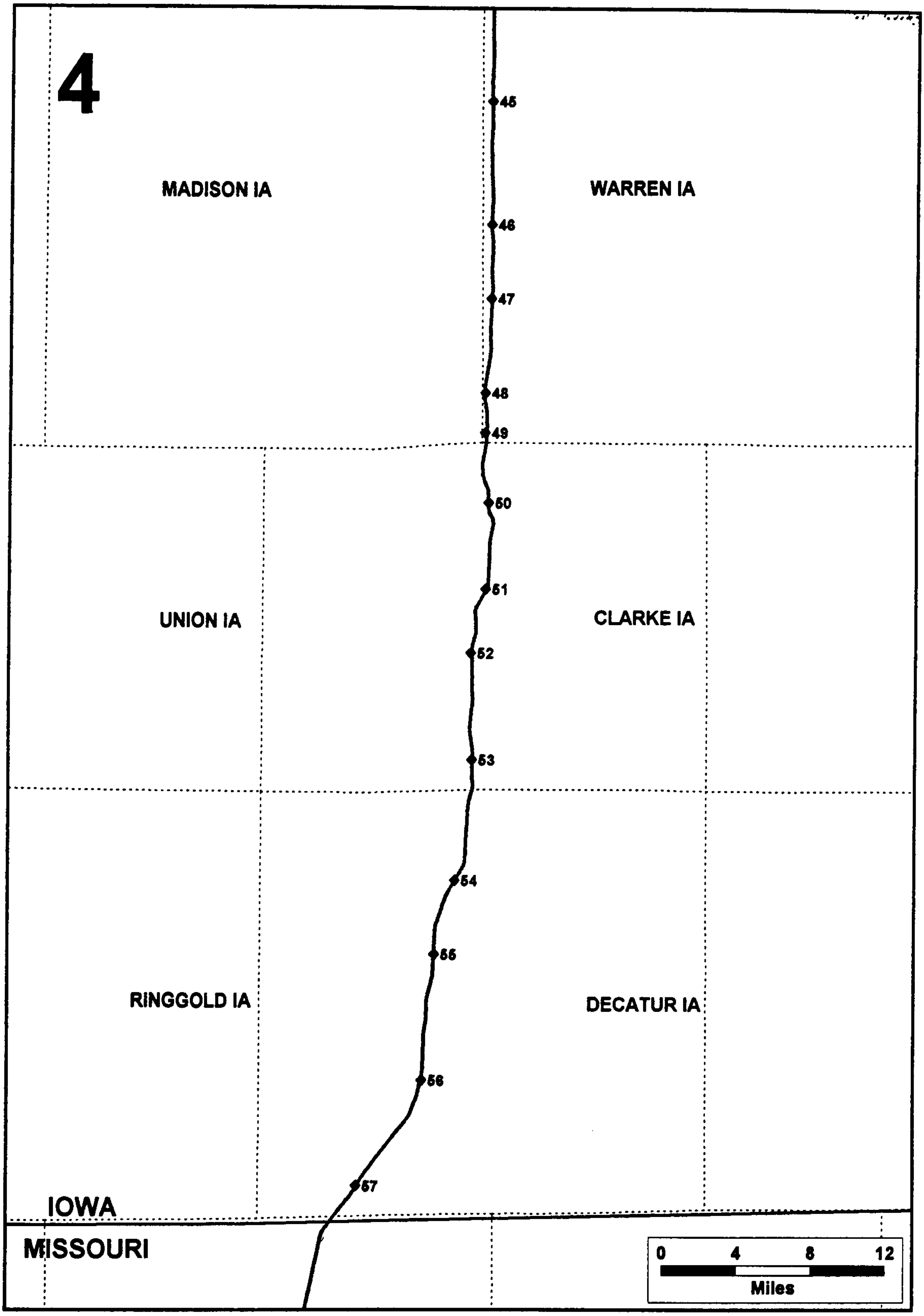
Locations of State Classification Data in Section three in Iowa



Source: Additional Reference 3

Figure C-2-f

Locations of State Classification Data in Section four in Iowa



Source: Additional Reference 3

- Five-axle tractor-semitrailers dominate, accounting for between one-half and 60 percent of the observed fleet at all locations.

- Double trailer combinations (STAA and all others) account for between 5 and 6 percent of the observed fleet at all locations.

- 3/4-axle tractor-semitrailers and truck + trailer combinations account for between 15 and 19 percent of the observed fleet at all locations.

- Six-axle tractor semitrailers and truck + trailer combinations are uncommon, accounting for between 1.5 and 2 percent of the observed fleet at all locations.

<u>Kansas</u>

Figure C-3 shows the locations of State classification data in Kansas. Data are available at 10 classification locations on the I-35 and the Kansas Turnpike in Kansas--five at rural sites (Table C-4-a) and five at urban sites (Table C-4-b). The data collected at these locations is summarized below:

Table C-4-a

Major Vehicle Classification Locations on I-35 in Kansas

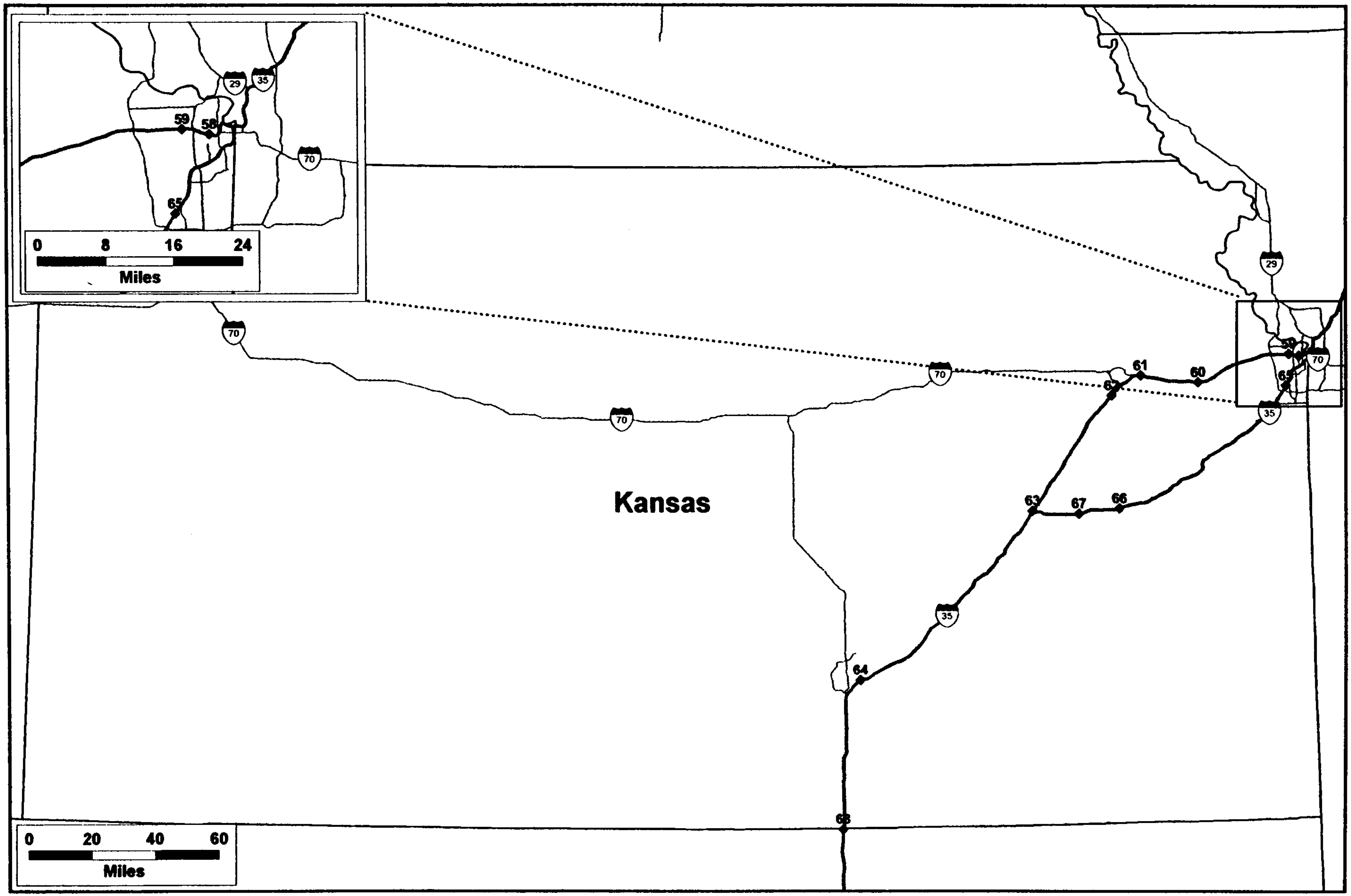
(Percent of the observed fleet)

		Rural Site No. (1995 AADTT)				
Vehicle Class	**Vehicle Configuration**	**60 (4518)**	**61 (3786)**	**62 (1328)**	**66 (2675)**	**67 (2875)**
		I-70	**I-70**	**I-335**	**I-35**	**I-35**
4,5,6	2/3-axle	14.23	14.71	14.46	10.43	13.22
7	4/5-axle	0.04	0.08	0.68	0.00	1.01
8	2-S1/S2	20.21	23.98	6.33	21.61	5.32
9	3-S2	53.72	48.65	58.21	61.72	75.44
10	3-S3/tr + tr	0.46	1.95	1.88	1.35	0.42
11	2-S1-2	7.28	6.18	3.09	4.19	4.28
12	3-S1-2	1.66	1.80	1.96	0.41	0.28
13	other doubles	2.39	2.64	13.40	0.30	0.03
14	unclassified	na	na	na	na	na
Total		99.99	99.99	100.01	100.01	100.00

Source: Vehicle Classification Count Summary: Regular Vehicle Classification - Kansas, 1995

site 60 Kansas Turnpike at Lawrence
site 61 Kansas Turnpike East of Topeka
site 62 Kansas Turnpike South of Topeka
site 66 At Emporia
site 67 East of Emporia

Figure C-3
Locations of State Classification Data in Kansas



Source: Additional Reference 4

Based on the data from these ten classification sites along the I-35 and Kansas Turnpike in Kansas: [Chapter 3--Ref. 1].

- Straight trucks (principally 2/3 axles, with some 4/5 axle) account for between 10 and 15 percent of the observed fleet--except close to Kansas City where they account for one-third to about 40 percent.

- Large double trailer combinations having 7 or more axles (class 13) account for: (1) about 2 percent of the truck traffic on the I-70 just west of Kansas City (about 125 units per day); (2) about 13 percent of the truck traffic on the I-335 between Topeka and Emporia (about 175 units per day on this link); (3) about 2.5 percent of the truck traffic on the (rural) I-70 between Lawrence and Topeka (about 100-110 units per day on this link); and (4) about 4 percent of the truck traffic on the I-35 close to Wichita (about 80 units per day).

- STAA double trailer combinations account for between 3 and 5 percent of the observed fleet on urban interstates, and 4.9 and 9 percent on rural interstates.

Table C-4-b

Major Vehicle Classification Locations on I-35 in Kansas

(Percent of the observed fleet)

				Urban Site No. (1995 AADTT)		
Vehicle Class	Vehicle Configuration	58 (9980)	59 (6475)	63 (1347)	64 (2162)	65 (7249)
		I-70	I-70	I-335	I-35	I-35
4,5,6	2/3-axle	32.25	33.63	14.70	11.80	40.46
7	4/5-axle	0.45	0.42	0.67	0.19	1.14
8	2-S1/S2	9.59	6.50	6.38	19.15	13.75
9	3-S2	51.42	53.62	58.13	58.83	40.86
10	3-S3/tr + tr	0.60	0.31	1.78	1.25	0.63
11	2-S1-2	4.33	3.06	2.75	3.79	2.41
12	3-S1-2	0.72	0.53	2.45	1.25	0.61
13	other doubles	0.64	1.95	13.14	3.75	0.12
14	unclassified	na	na	na	na	na
Total		100.00	100.02	100.00	100.01	99.98

Source: Vehicle Classification Count Summary: Regular Vehicle Classification - Kansas, 1995

site 58 West of Kansas City
site 63 Kansas Turnpike at Emporia
site 65 South west of Kansas City
site 59 West of Kansas City
site 64 At Wichita

- 3/4-axle tractor-semitrailers and truck + trailer combinations account for between a low of 6 percent (away from urban areas) and nearly one-quarter (close to urban areas) of the observed fleet at these ten different classification sites.

- Configurations with tridem axles are uncommon, accounting for between 0.3 and 2 percent of the observed fleet at these sites.

Oklahoma

Figure C-4 shows the locations of State classification data in Oklahoma and Texas. Data are available for five classification locations on the I-35 in Oklahoma--three at rural sites and two at urban sites (Table C-5). The data collected at these locations is summarized below:

Table C-5
Major Vehicle Classification Locations on I-35 in Oklahoma
(Percent of the observed fleet)

		Rural Site No. (1990 AADTT)			**Urban Site No. (1990 AADTT)**	
Vehicle Class	Vehicle Configuration	**68** (2885)	**69** (2661)	**72** (47602)	**70** (5512)	**71** (4262)
		I-35	**I-35**	**I-35**	**I-35**	**I-35**
4,5,6	2/3-axle	9.85	14.50	11.91	28.32	26.95
7	4/5-axle	nil	nil	nil	nil	nil
8	2-S1/S2	3.36	3.23	4.10	6.08	3.17
9	3-S2 *	83.40	79.59	81.20	62.45	68.60
10	3-S3/tr + tr *					
11	2-S1-2 #	3.40	2.67	2.79	3.16	1.29
12	3-S1-2 #					
13	other doubles #					
14	unclassified	nil	nil	nil	nil	nil

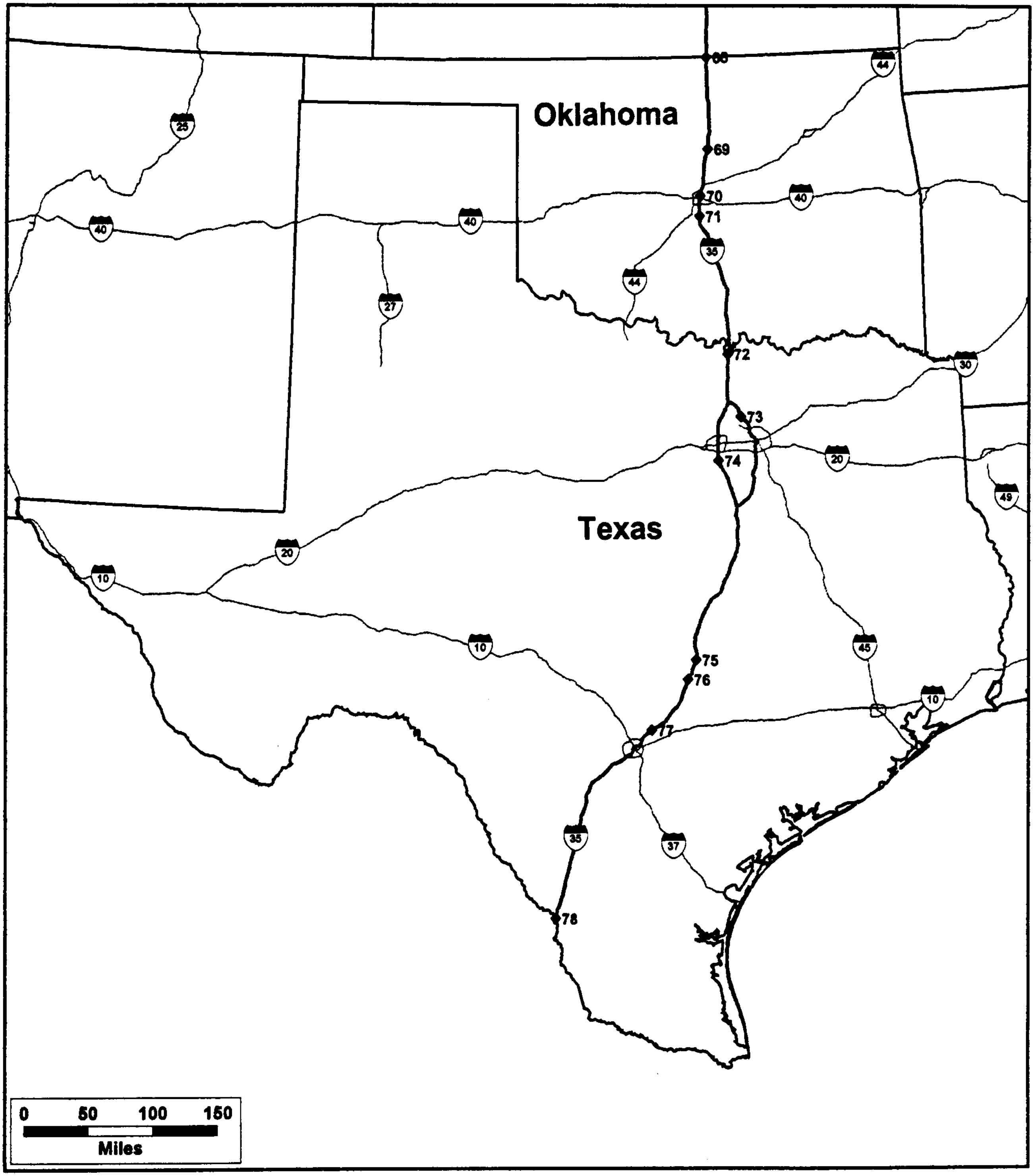
Source: Oklahoma 1990 Traffic Characteristics

* Class 9 data includes Class 10.
# Class 11 data includes Class 12 and 13.

site 68 Just south of the Oklahoma-Kansas border
site 69 At Cimarron River
site 72 Just north of the Oklahoma-Texas border
site 70 At Oklahoma City
site 71 South of Oklahoma City at Norman

Figure C-4

Locations of State Classification Data in Oklahoma and Texas



Source: Additional Reference 9

Based on the data from these five classification sites along the I-35 in Oklahoma: [Chapter 3--Ref.1]

- Straight trucks (effectively all 2/3-axle) account for between 10 and 15 percent of the observed fleet at rural sites, and about one-quarter of the observed fleet near Oklahoma City.

- Five-axle tractor-semitrailers (combined with some 6-axle units) dominate the truck fleet, accounting for about two-thirds of the observed fleet at urban sites, and nearly 80 percent of the observed fleet at rural classification sites.

- Double trailer combinations (STAA and all others) account for between 1.3 and 3.4 percent of the observed fleet at the five classification sites.

- 3/4-axle tractor-semitrailers (class 8) and truck + trailer combinations account for between 3 and 6 percent of the observed fleet at these five different classification sites.

Texas

Data are available at six classification locations on the I-35 in Texas (Figure C-4)--two at rural sites and four at urban sites. The data collected at these locations is summarized in Table C-6. [Chapter 3--Ref. 1].

Based on the data from these six classification sites along the I-35 in Texas:

- Straight trucks (effectively all 2/3-axle) account for about 30 percent of the observed fleet--from a low of about 15 percent in Laredo to a high of more than 40 percent on the south side of Fort Worth.

- Five-axle tractor-semitrailers dominate the fleet mix, accounting for about 60 percent of the observed fleet--from a high of about three-quarters at Laredo to a low of about 47 percent on the south side of Fort Worth.

- STAA double trailer combinations account for between 1.5 and 4.6 percent of the observed fleet at all classification locations.

- 3/4-axle tractor-semitrailers and truck + trailer combinations account for between 6 and 8 percent of the observed fleet.

Table C-6

Major Vehicle Classification Locations on I-35 in Texas

(Percent of the observed fleet)

		Rural Site No. (1995 AADTT)		**Rural Site No. (1995 AADTT)**			
Vehicle Class	**Vehicle Configuration**	**76** (7692)	**77** (9019)	**73** (6797)	**74** (7237)	**75** (10655)	**78** (2969)
		I-35	**I-35**	**I-35 (E)**	**I-35 (W)**	**I-35**	**I-35**
4,5,6	2/3-axle	28.24	27.47	30.57	42.60	31.38	15.70
7	4/5-axle	0.03	0.07	0.06	0.06	0.08	0.03
8	(2-S1/S2)	6.24	6.86	6.06	8.26	6.18	6.23
9	(3-S2)	61.14	61.49	59.84	46.95	57.18	74.20
10	(3-S3/tr + tr)	0.51	0.72	0.46	0.58	0.54	0.91
11	(2-S1-2)	3.13	2.58	2.63	1.12	3.52	2.32
12	(3-S1-2)	0.72	0.80	0.38	0.43	1.12	0.44
13	(other doubles)	0.00	0.00	0.00	0.00	0.00	0.17
14	(unclassified)	0.00	0.00	0.00	0.00	0.00	0.00
Total		100.01	99.99	100.00	100.00	100.00	100.00

Source: Texas Department of Transportation: 1995 Vehicle Classification Report

site 76	Just south of Austin	site 77	South of San Antonio
site 73	North of Dallas	site 74	South of Fort Worth
site 75	Just north of Austin	site 78	At Laredo

APPENDIX D

Emerson Scale Survey

ORIGIN-DESTINATION SURVEY

Date: ______________________ Time: ________________ Base of Operation: ______________________

Traffic Direction: NB SB Company Name: ____________________________

1. Vehicle Configuration and Body Type

BODY TYPE	2-3-4-axle	TT@ 4-5-6-axle	2-S1 / 2-S2	3-S1 / 3-S2	2-S3 / 3-S3	3-S2-S2/ 3-S3-S	3-S2-2	2-S1-2/3-S1-2	Tractor Only	LENGTH	Other
Van											
Regr. Van											
Pole, logging											
Container											
Platform											
Tank liquids,gas											
Tank, dry bulk											
Dump											
Grain bodies											
Garbage truck											
Auto transp											
Live stock											
Other											

2. Empty?______ Loaded?_______

3. Axle Group Weights

Axle Group	Weight
1	
2	
3	
4	
5	
6	
7	
8	
Total	

4. Principal commodity:

other	live animals	fresh farm products	processed foods	animal feed	mining products
building materials	logs & forest products	lumber & fab. wood	paper &paper prods	chemicals &/or drugs	petroleum& products
plastics, rubbers	primary metal	fab. metal products	machinery	transport equipment	furniture
glass products	textiles & apparels	misc. prods of manufact.	household furniture	misc. tools , parts	mixed cargo
scrap, garbage,septic	industrial waste water	hazardous waste (EPA)	hazardous (non-EPA)	recyclable products	

5. Principal Origin: City:__________________ Province/State:______________________

6. Principal Destination: City:________________ Province/State:______________________

7. Route to Take: ____

Prepared by Transportation Division - University of Manitoba

08/11/96

Figure D-1-a
Origin-Destination of Northbound Trucks Hauling Farm Products Through the Emerson Scale
(number shows percent of loaded trucks for which O-D was known)

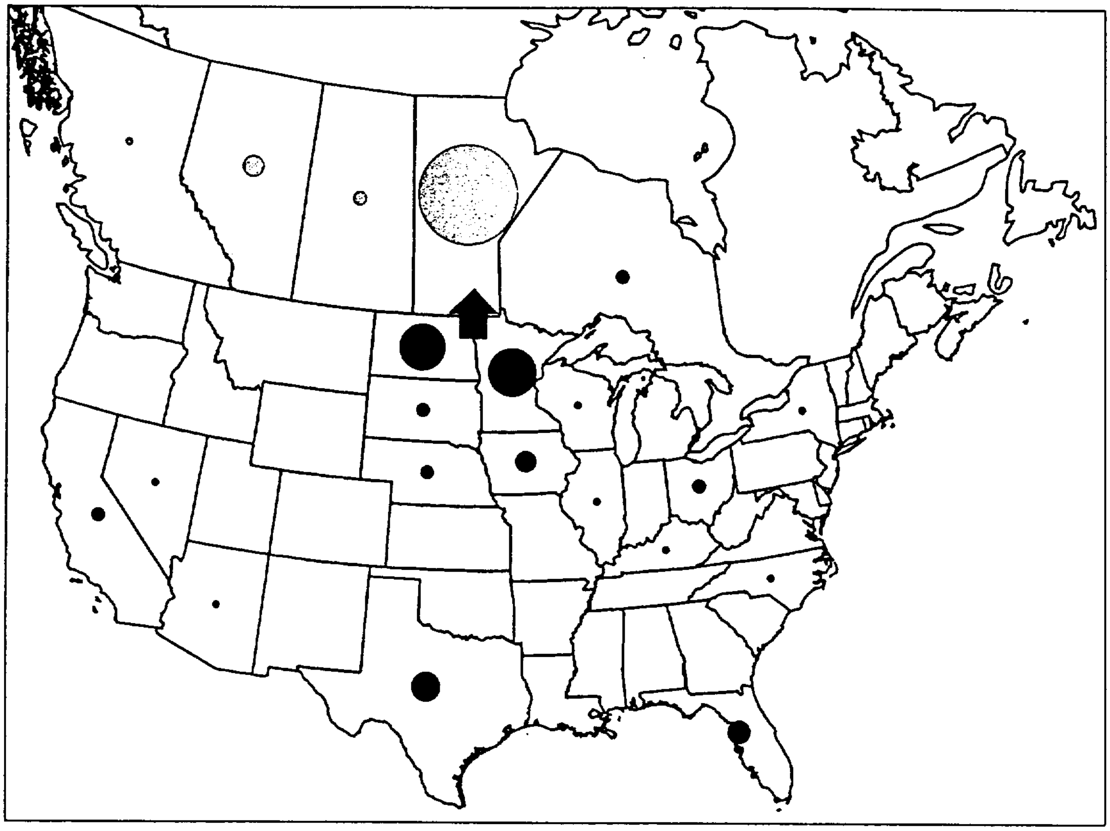
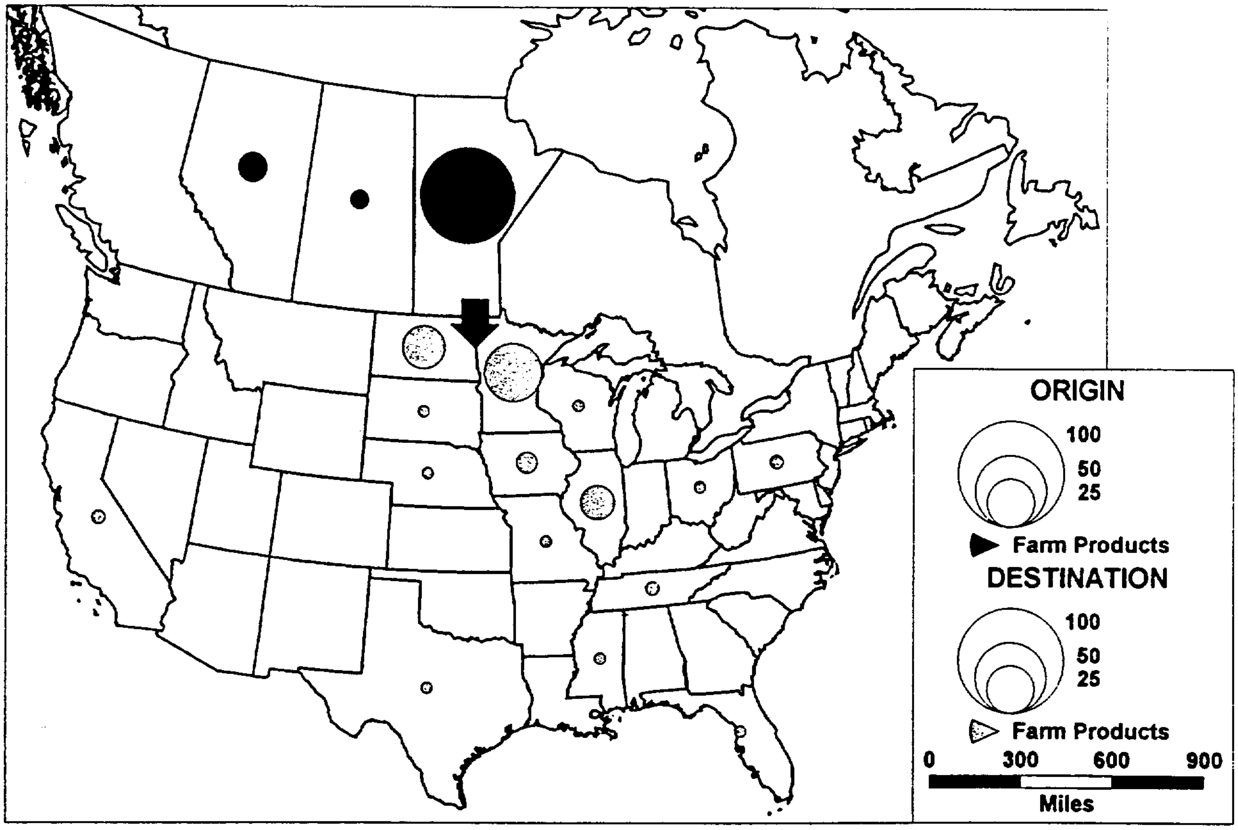


Figure D-1-b
Origin-Destination of Southbound Trucks Hauling Farm Products Through the Emerson Scale
(number shows percent of loaded trucks for which O-D was known)



Source: Emerson Scale Survey

Figure D-2-a
Origin-Destination of Northbound Trucks Hauling Lumber Through the Emerson Scale
(number shows percent of loaded trucks for which O-D was known)

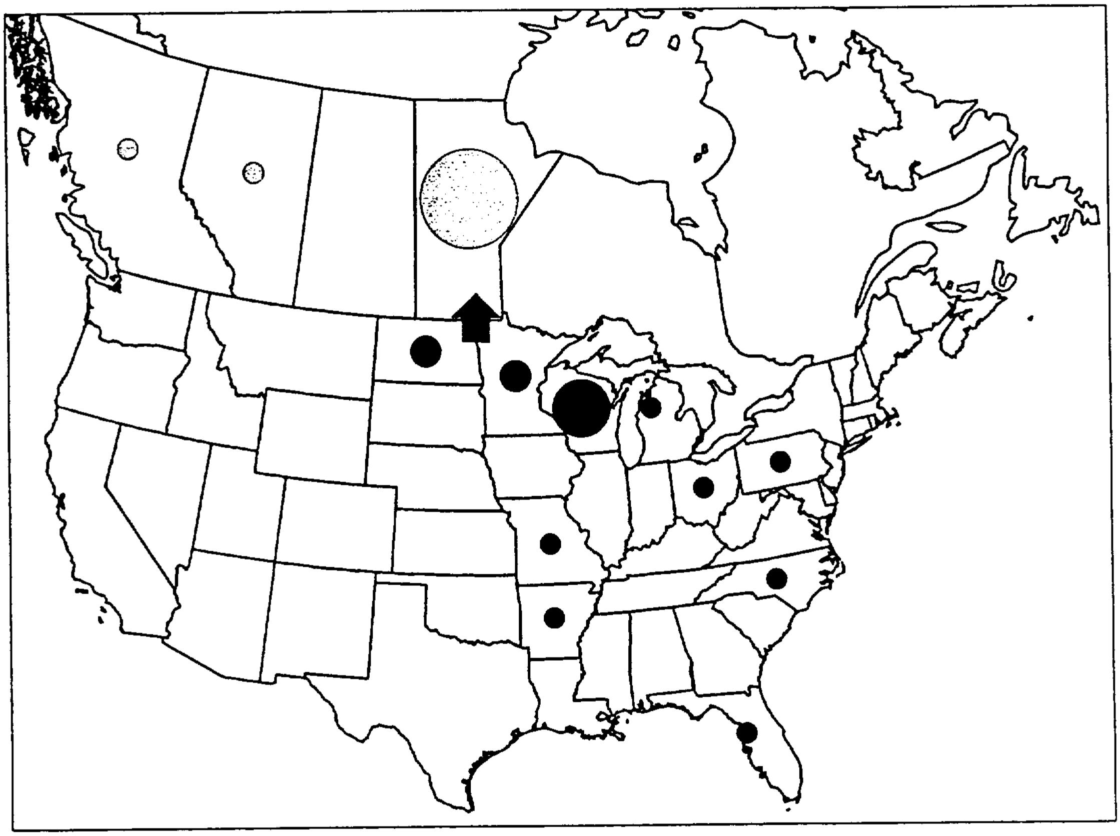
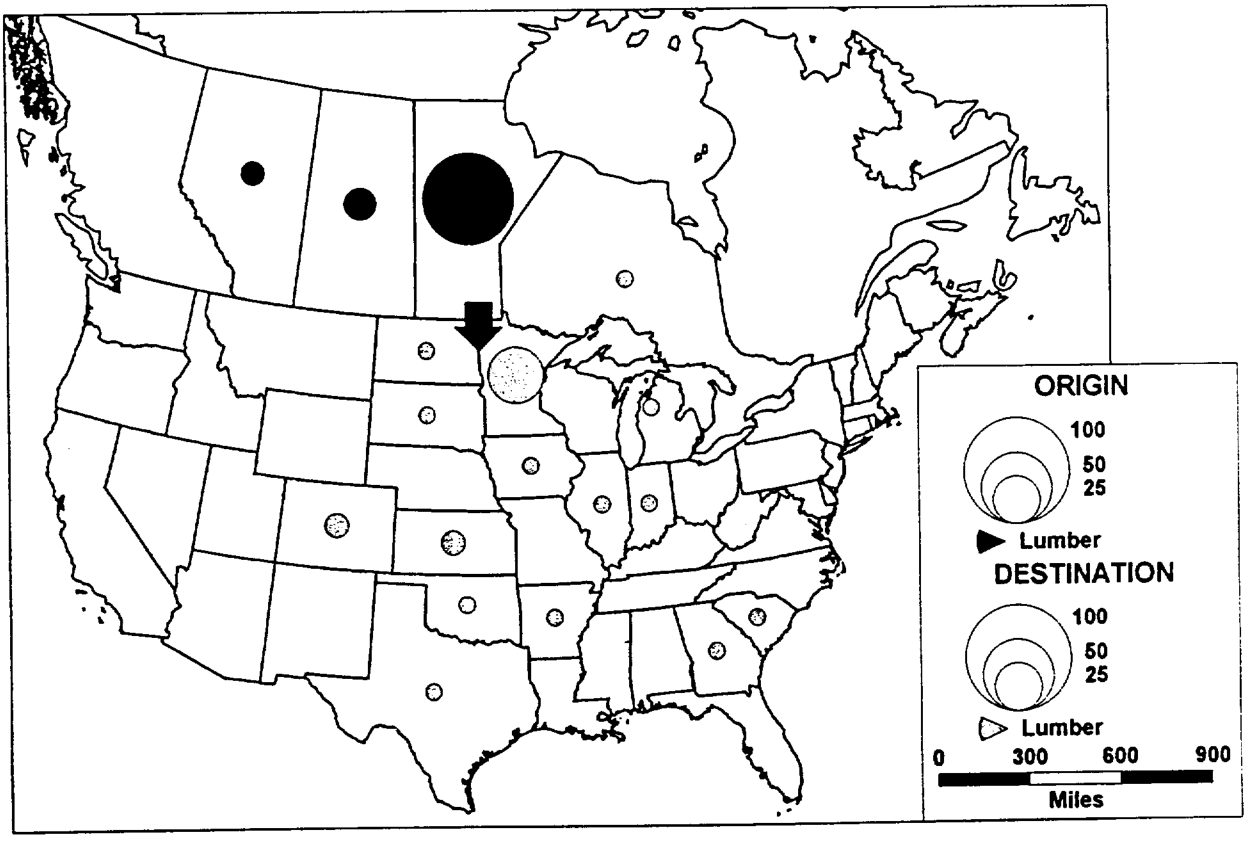


Figure D-2-b
Origin-Destination of Southbound Trucks Hauling Lumber Through the Emerson Scale
(number shows percent of loaded trucks for which O-D was known)



Source: Emerson Scale Survey

Figure D-3-a
Origin-Destination of Northbound Trucks Hauling Machinery Through the Emerson Scale
(number shows percent of loaded trucks for which O-D was known)

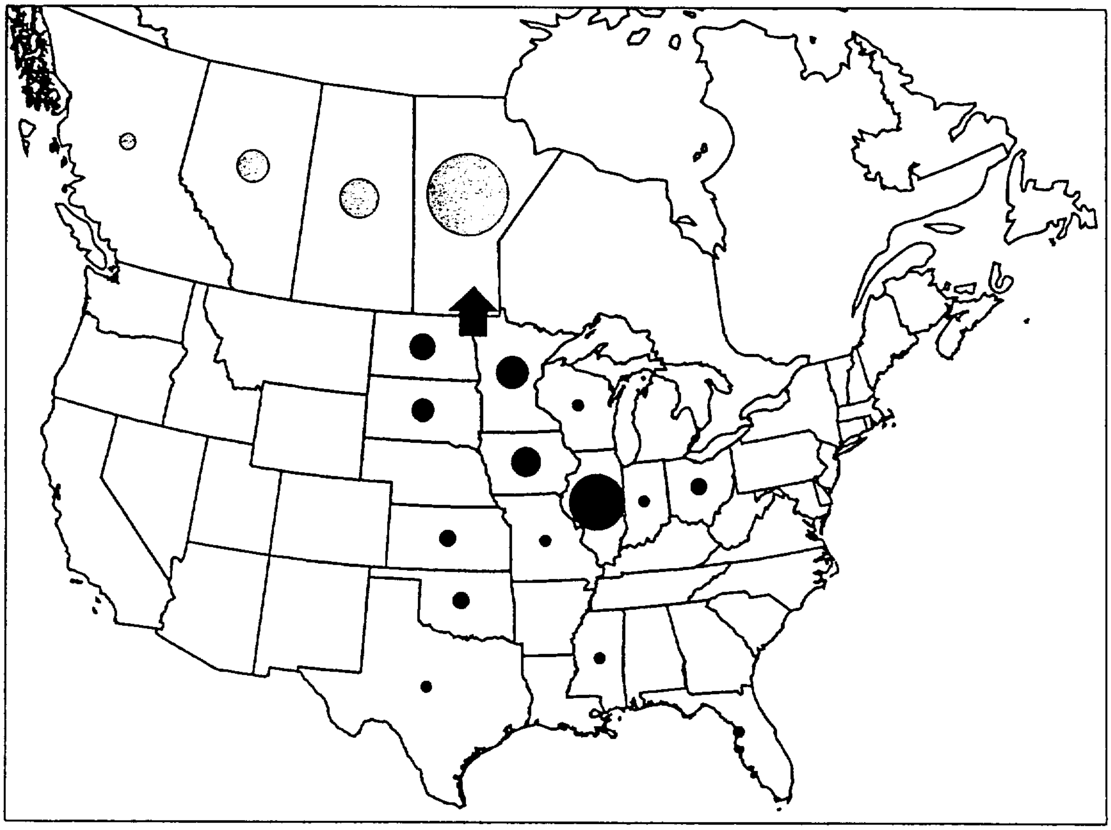
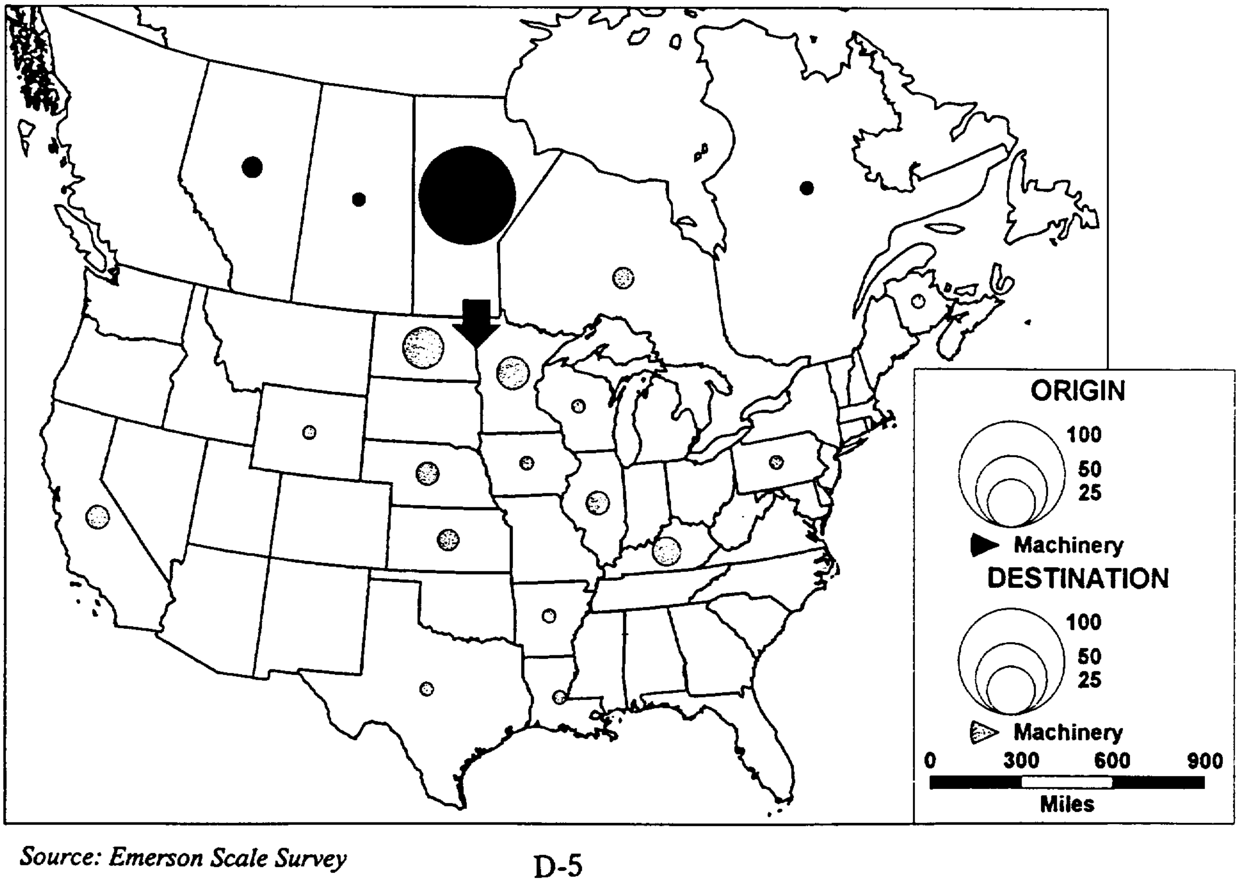


Figure D-3-b
Origin-Destination of Southbound Trucks Hauling Machinery Through the Emerson Scale
(number shows percent of loaded trucks for which O-D was known)



Source: Emerson Scale Survey

Figure D-4-a

Origin-Destination of Northbound Trucks Hauling Paper Through the Emerson Scale

(number shows percent of loaded trucks for which O-D was known)

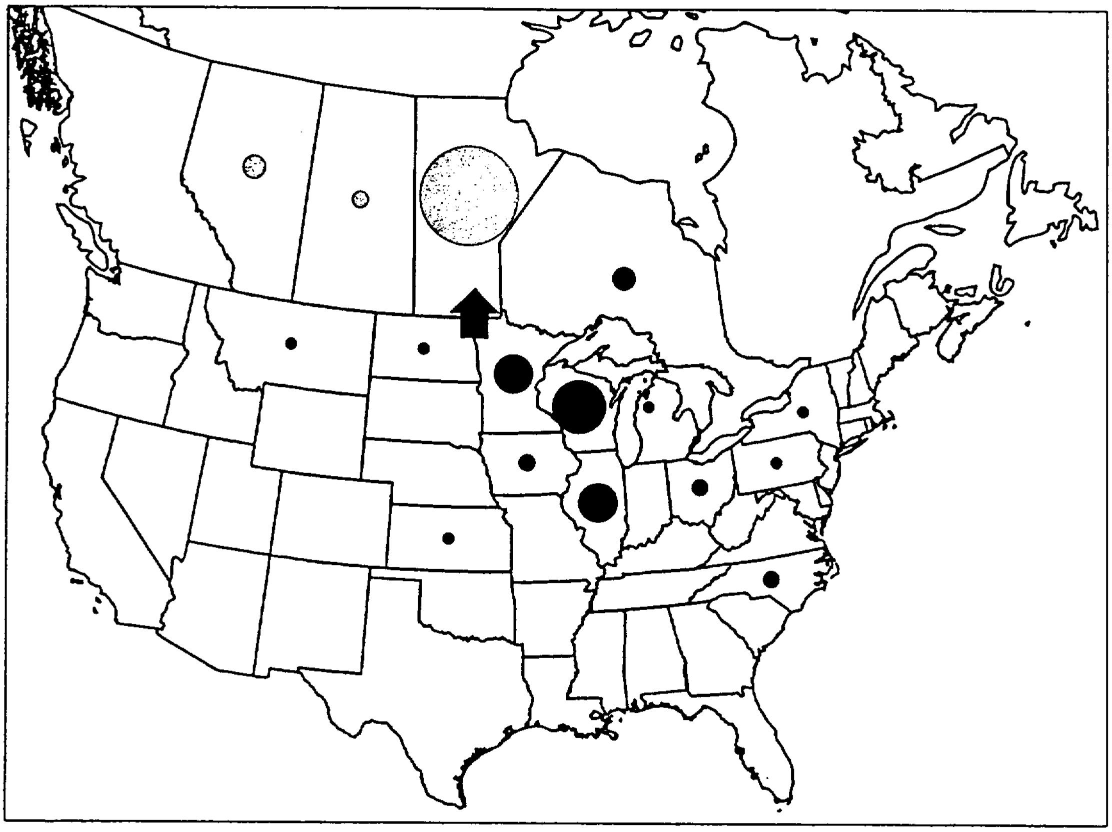
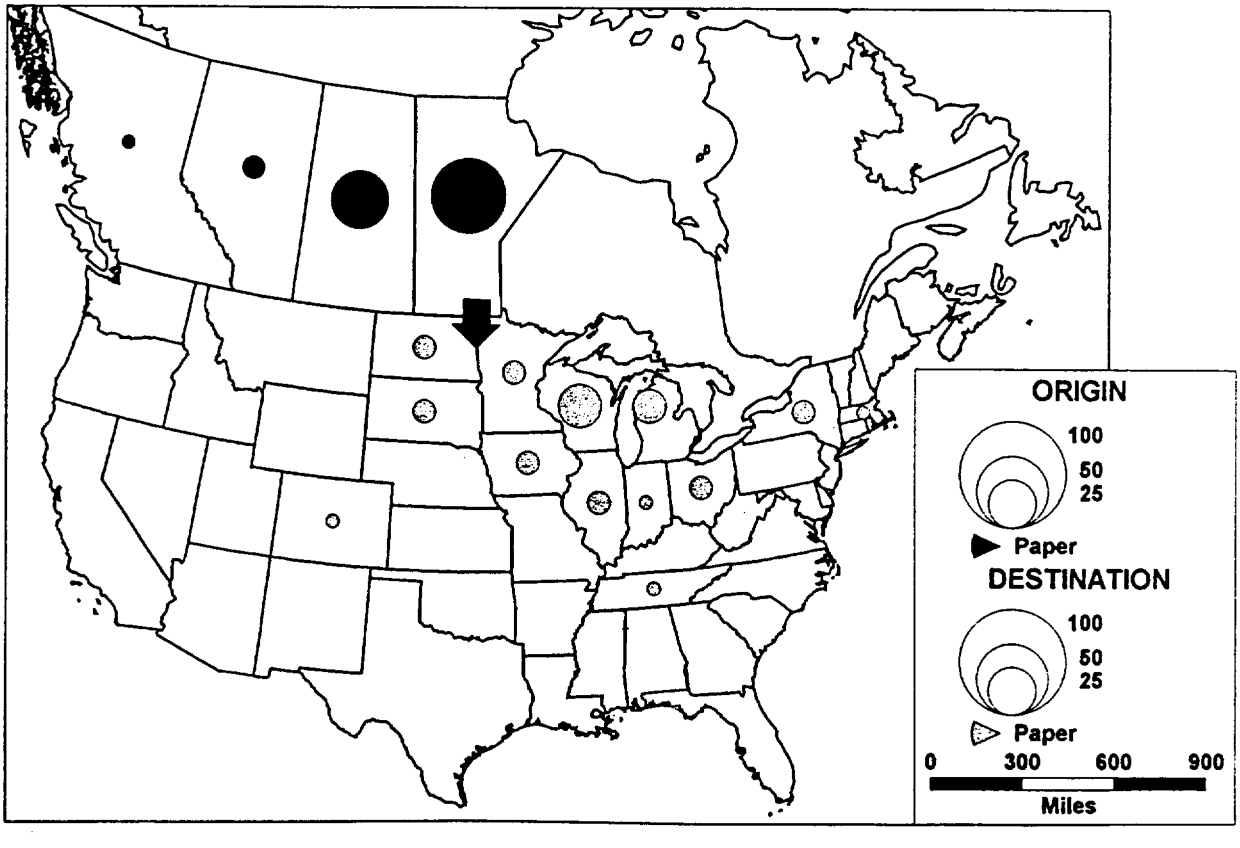


Figure D-4-b

Origin-Destination of Southbound Trucks Hauling Paper Through the Emerson Scale

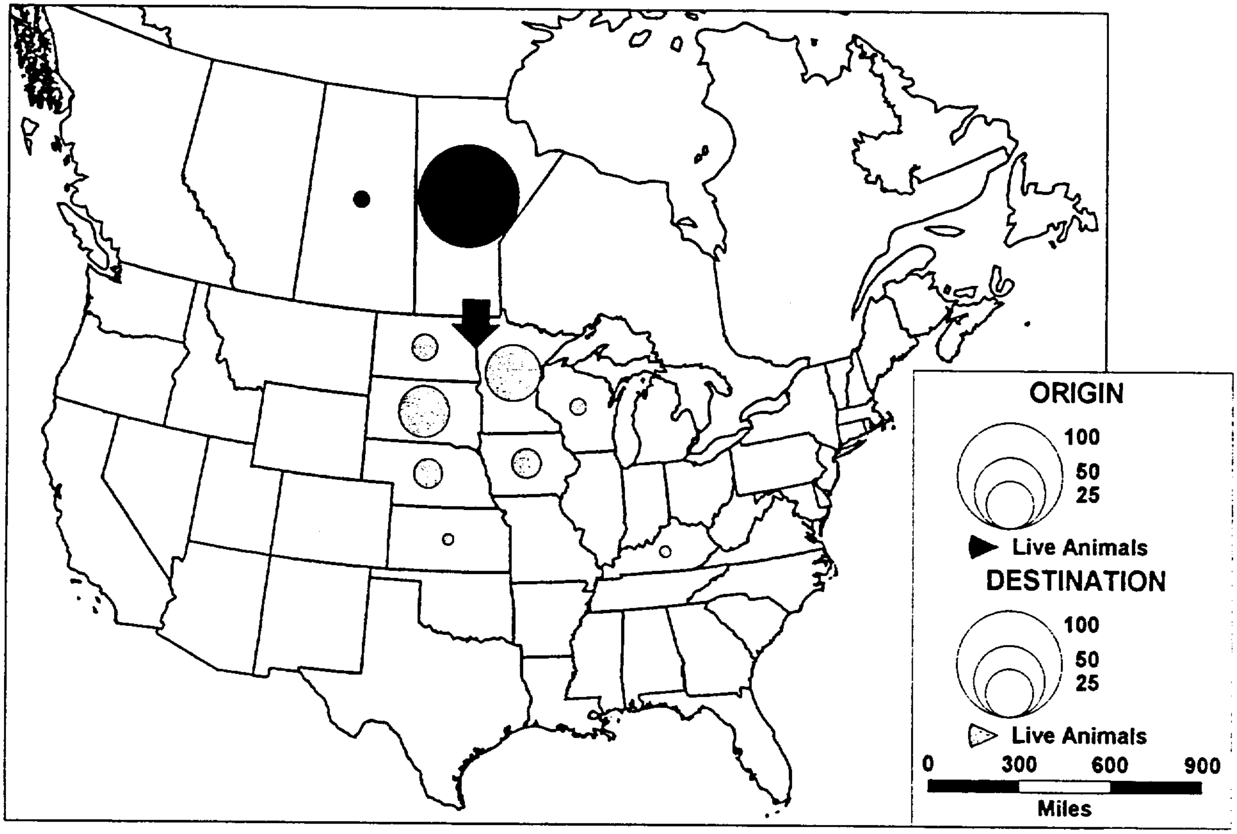
(number shows percent of loaded trucks for which O-D was known)



Source: Emerson Scale Survey

Figure D-5-a

Origin-Destination of Southbound Trucks Hauling Live Animals Through the Emerson Scale
(number shows percent of loaded trucks for which O-D was known)



Source: Emerson Scale Survey

Figure D-6-a

Origin-Destination of Northbound Grain Bodies Through the Emerson Scale

(number shows percent of loaded trucks for which O-D was known)

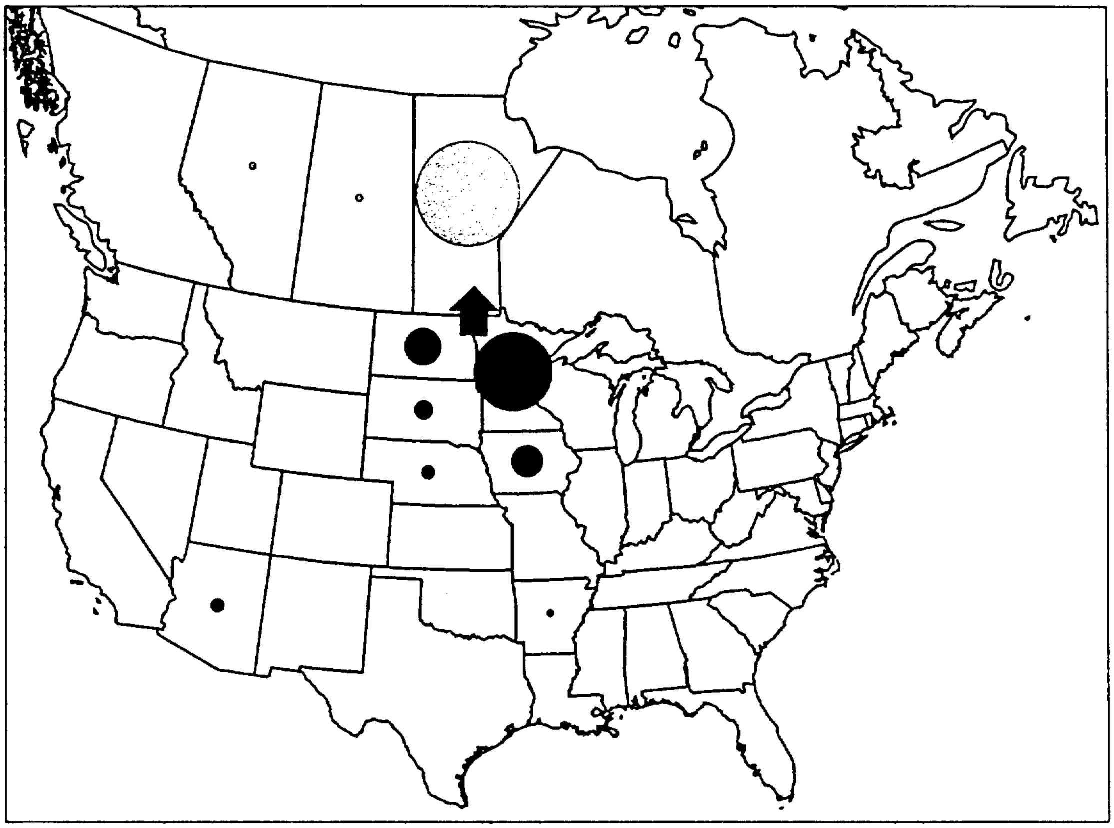
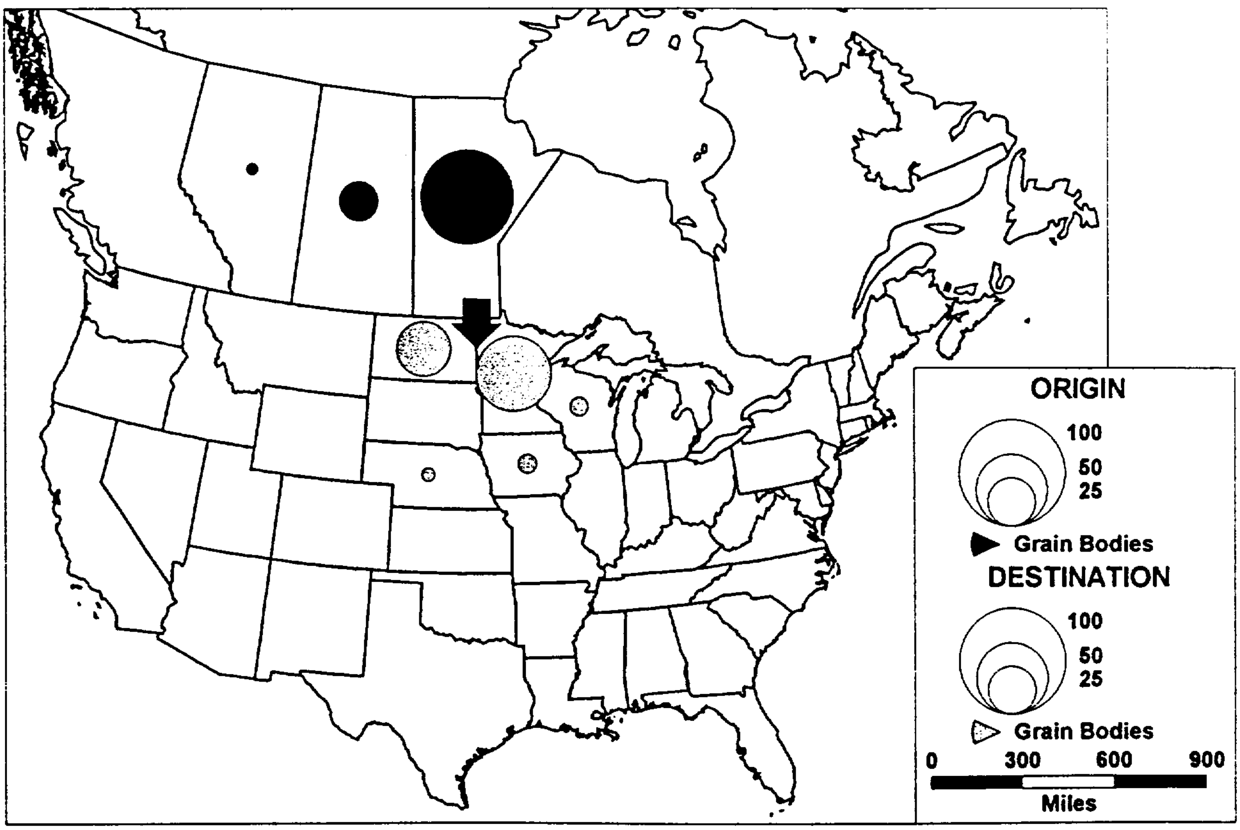


Figure D-6-b

Origin-Destination of Southbound Grain Bodies Through the Emerson Scale

(number shows percent of loaded trucks for which O-D was known)



Source: Emerson Scale Survey

APPENDIX E

Manitoba-based Truck Load Carrier Survey

Manitoba-based Truck Load Carrier Survey

The items that were discussed with the carriers are the following:

1. Routes of operation (*i.e.* U.S. highway No. 2 vs. P.T.H. No. 1)
2. Weight increase allowance in MN and ND
3. GVW at which carriers operate in winter months in MN and ND
4. In transit movements through Emerson or crossings to the east
5. Use of 3-S3s not on IS highways
6. Triangulation
7. When returning from trip--empty or loaded?
8. Weight distributions of operation
9. Comments on type of equipment (lighter tare weight due to competition with U.S. carriers?)
10. Semitrailer lengths (48' vs. 53')
11. Vehicle width (96" vs. 102")
12. Vehicle height
13. Split tandems
14. Lift axles
15. Wide-base tires
16. Kingpin setting restrictions
17. Use of U.S. drivers and equipment to facilitate certain cross border operations
18. Enforcement issue in the U.S.
19. Operations south of Kansas City or into Mexico
20. Rail competitive areas
21. Do they operate intermodal?
22. Location of other terminals in the U.S.
23. Total size of fleet and mix of vehicles
24. Proportion of fleet that crosses the border
25. Competition and rates
26. Permitting
27. Relevance of I-29 and I-35 to operations
28. Opinion to enhance activities

The following sections discuss the information gathered from each of the nine interviews conducted during this survey.

E.1 Arnold Brothers Transport Ltd. (Interview conducted on October 16, 1996)

The corporate headquarters of Arnold Brothers Transport is located in Winnipeg, Manitoba. There are terminals in most Canadian provinces and there is one terminal located in Chicago, Illinois. There are four trailer drop yards in Canada.

Arnold Brothers Tranport specializes in truckload movements of food products, paper, wood products, steel products, machinery, furniture, auto parts and other general freight from Canada to the Great Lake Region. There are very few movements that are destined for places south of Kansas City, and there are no movements into Mexico at this point.

Fleet

The fleet consists of approximately 375 tractors and 875 trailers. The types of trailers owned and operated by Arnold Brothers Transport include dry vans, reefer vans (which account for approximately 40 percent of the trailers), heated vans, stake and rack, flatbeds, drop decks, extendable drop decks, and double drop deck trailers.

Sixty percent of Arnold Brothers trailer fleet are 48-foot semitrailers, and the other forty percent are 53-foot. All new semitrailers in the past six months have been 53 footers. The standard trailer width is 102 inches.

Operations and Truck Size and Weight (TS&W) Issues

Arnold Brothers Transport moves approximately 30 shipments per day from the Winnipeg terminal. Most of the company's operations take place within Canada. About one-quarter of the total operations either originate or are destined for the U.S. At the present time, the company is again trying to increase the amount of service provided to and from the U.S.

Arnold Brothers Transport runs on I-29 from the Emerson-Pembina border to Fargo, North Dakota and mainly on I-94 from Fargo to the destinations in the Great Lake Region. Traffic running between Winnipeg and Toronto is often routed across U.S. Route 2. This is because it is shorter in distance, the travel time is shorter, and because the operating cost is lower than running on the TransCanada Highway.

Most of the operations into the U.S. involve triangulation. A typical operation from its terminal in Winnipeg, Manitoba consists of: (1) Winnipeg with a load to Wisconsin; (2) the vehicle either re-loads in Wisconsin or dead-heads from Wisconsin to Illinois; (3) load pick up in Illinois for drop off in Toronto; (4) the vehicle reloads and heads back to Winnipeg.

Very few U.S. drivers and little U.S. equipment are employed by Arnold Brothers in its operations. However, the company believes that if more U.S. drivers or equipment were used in cross border operations, there would be more flexibility in terms of picking up loads in the U.S. and also in equipment repositioning.

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. The 10 percent winter weight allowance in Minnesota is of no consequence to the company because most of the freight is (1) not destined for Minnesota; (2) destined for States that have a maximum allowable GVW of 80,000 pounds; or (3) needs to travel through States that have a maximum allowable GVW of 80,000 pounds.

In terms of split tandems, the company thinks that at the moment split tandems are not critical to its operations. However, if this type of axle configuration were allowed in Manitoba, that could increase the company's opportunities in the movement of freight from Winnipeg to the U.S. and Ontario.

Lift axles are only used for one contract customer (in Ontario) by the company. Therefore the company can really only speculate that by using lift axles maintenance costs would decrease and tire wear would not be as extensive. This is because the driver would be able to rotate the tires to the lift axle.

Truck-rail Competition

Arnold Brothers Transport owns a fleet of twenty 48-foot domestic containers which operate across Canada. According to the company, rail is only competitive in long-haul movements--Ontario to British Columbia and less time-sensitive operations. However, the general opinion is that "there is still a lot of traffic that cannot go on rail".

In terms of the relevance of I-29 and I-35 to its truck operations, Arnold Brothers commented that this corridor is of little relevance to the company because only 25 percent of its operations originate or end in the U.S. The only segment of this corridor that would be useful to the company is the segment from the Emerson-Pembina border to Fargo. This is because almost all of the destinations are in the northeast area of the U.S. and not in the southern States.

Finally, Arnold Brothers Transport is of the opinion that in order to enhance truck operations between the U.S. and Canada, truck size and weight laws should be harmonized in the two countries.

E.2 Big Freight Systems Inc. (Interview conducted on October 22, 1996)

The corporate headquarters of Big Freight Systems Inc. is located in Steinbach, Manitoba. There are three other terminals in Canada. These are located in Calgary, Toronto and Montreal. There are no terminals in the U.S.

Big Freight specializes in U.S.-Canada truckload movements from western Canada to the U.S. Midwest, from Ontario to western Canada, and from western Canada to Washington and Oregon. The major commodities hauled into the U.S. include farm machinery, construction equipment, and steel. The major commodities moved into Canada from the U.S. include construction equipment, farm products, farm equipment, lumber (from Washington), and parts for manufacturing (from the Ohio area). From eastern Canada to western Canada, one of the major commodities moved is bulk glass. About 99.9 percent of its operations are TL.

There are very few movements that are destined for places south of Kansas City, and there are no movements into Mexico. This is because "there are many good opportunities for the company in eastern U.S."

Fleet

The fleet consists of 245 tractors and 375 trailers (about 20 percent of these are equipped with tridem axles). The trailers are mainly flatbeds, drop decks and lowboys. There are some B-trains and super B-trains. Big Freight also uses vans in some of its operations (the vans are not owned by the company, but are included as part of an agreement between Big Freight and Canadian National). The company does not own any 53-foot trailers because of the nature of the commodities hauled (dense commodities). The standard trailer width is 102 inches. Almost all of Big Freight's activity weighs-out.

Big Freight operates tridems into the U.S. with typical payloads of about 44,000 pounds. According to the company, there is a benefit to the use of tridems, specially when hauling equipment. This is because "there is more flexibility on axle requirements in terms of weight".

During the past yew years Big Freight has shifted to lighter equipment in order to compete with U.S. carriers. Also because certain commodities have forced the company to use this lighter equipment. With this new equipment, typical payloads on the deck fleet are about 48,000 pounds. At 80,000 pounds GVW, this allows a tare weight of about 32,000 pounds. According to Big Freight, the tare weight of (1) a fully equipped tractor is about 20,500 pounds; (2) a tandem flatbed is about 10,250 pounds; and (3) a tandem drop deck is about 11,000 pounds. On the vans, typical payloads are about 45,000 pounds, but in winter the payloads may go as high as 53,000 pounds.

Operations and Truck Size and Weight (TS&W) Issues

About one-half of the company's operations either originate or are destined for the U.S. Traffic running between Winnipeg and eastern Canada is often routed across U.S. Route 2 (between 10 and 15 percent of the time). This is because it is shorter in distance, the travel time is shorter, and the roads are better. It also depends on the weight of the load and on the final destination in Ontario (northern versus southern Ontario). Most of Big Freight's operations take place across the Pembina-Emerson crossing. However, some trucks move across the Roseau-South Junction crossing and the Warroad-Sprague crossing. The selection of the crossing depends on things such as: (1) the destination of the load; (2) the origin of the load; (3) customer requests; and (4) where loading took place.

Most of the company's operations into the U.S. involve triangulation. A typical operation from its terminal in Steinbach, Manitoba consists of: (1) Manitoba with farm equipment to Kansas; (2) the vehicle dead-heads from Kansas to Nebraska; (3) load pick up for drop off in western Canada; (4) lumber pick up in western Canada for drop off in Winnipeg. Another typical triangulation operation consists of: (1) Manitoba with steel to U.S. Midwest; (2) manufactured products pick up for drop off in southern Ontario; (3) load pick up for drop off in Manitoba.

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. This is because most of the operations are destined for States that have a maximum allowable GVW of 80,000 pounds.

The 10 percent winter weight allowance in Minnesota and North Dakota is used by the company only in its intermodal operation. Between 10 and 15 tractors with vans are used to haul agricultural products from Minnesota and North Dakota to Winnipeg. The vans are then shipped by rail from Winnipeg to eastern Canada, for final delivery, by truck, in the eastern U.S. This operation takes place using Canadian rail lines because "the Canadian rail system is superior to the U.S. rail system". Thus, in winter, the company operates at GVWs of about 85,000 pounds only in the intermodal operation.

In terms of split tandems, Big Freight does not operate any trucks equipped with this type of axles. However, the company thinks that this type of axle arrangement would be beneficial to its operations due to the flexibility of loading.

Lift axles are not used and would not be used by the company because they add tare weight to the trucks and also because there are "too many operating restrictions". Another reason is that with the use of lift axles, the fleet would become "specialized" or "equipment-specific", therefore restricting its access area.

With respect to wide-base tires, Big Freight is not interested on this type of tires because they are mainly for localized movement. Another reason for not being attracted to this type of tires is that by using them, trucks would always be forced to carry spare tires, which would add to the tare weight of the vehicle. Thus, "the benefits of a super single in terms of weight is taken away by the need to carry the extra tire".

Truck-rail Competition

Big Freight's intermodal operations were already discussed in the previous section. In terms of competitive issues, the company thinks that rail is only competitive in: (1) east-west long-haul movements (this is because of rail rates); (2) less time-sensitive operations; and (3) with the movement of low-value, resource-based commodities. Rail is not competitive regarding service.

Law Enforcement

According to Big Freight, law enforcement in the U.S. is adequate. However, in Manitoba, it is "becoming more and more high profile and concentrated". It seems that enforcement officials focus only on the big, well known carriers and do not pay as much attention to the smaller ones. By doing this, these officials may be overlooking carriers that operate more unsafe equipment and that need to be checked.

In terms of the relevance of I-29 and I-35 to its truck operations, Big Freight commented that this corridor is of little relevance to the company because this is a customer-driven organization, and at the present time, most of its operations are destined for the eastern Midwest area of the U.S.

Finally, Big Freight is of the opinion that in order to enhance truck operations between the U.S. and Manitoba, the government should encourage and foster economic activity in Manitoba.

E.3 Bison Transport (interview conducted on October 23, 1996)

The corporate headquarters of Bison Transport is located in Winnipeg, Manitoba. There are trailer drop yards in most Canadian provinces and there are two drop yards in the U.S.; one in Fargo, North Dakota and the other in Chicago, Illinois.

Bison Transport specializes in U.S.-Canada truckload movements. The major destination is the U.S. Midwest. There are very few movements that are destined for places south of Kansas City. Main destinations south of Kansas City are in Texas (Dallas, Houston and El Paso). The major commodities hauled into the U.S. are pulp and paper, agricultural products, and other general freight. There are no movements into Mexico.

Fleet

The fleet consists of approximately 300 tractors and 500 trailers. All the trailers are vans, none of which are equipped with refrigerating units. Fifteen percent of Bison's trailer fleet are 48-foot semitrailers, and the other eighty-five percent are 53-foot. All new semitrailers in the past year have been 53 footers. The standard trailer width is 102 inches and the height is 13.5 feet.

Bison Transport owns approximately 15 tridem-axle semitrailers. However, these are not taken into the U.S. because they are not allowed in certain States.

During the past few years Bison has shifted to lighter equipment in order to compete with all carriers and also because certain commodities (paper, for example) have forced the company to use this lighter equipment. With the lighter equipment, typical payloads are about 44,000 pounds or sometimes as high as 47,000 pounds. At 80,000 pounds GVW, this allows a tare weight of about 35,000 pounds. According to Bison, the tare weight of its tractors is approximately 19,500 pounds and of its 53-foot trailers is about 14,000 pounds, for a combined tare of 33,500 pounds.

Operations and Truck Size and Weight (TS&W) Issues

At Bison Transport, on average, a tractor with a single driver travels 150,000 miles per year. If the tractor is being operated by a double team, the mileage increases to approximately 250,000 miles per year. Approximately 10 percent of the operations take place using double teams.

About two-thirds of the company's operations either originate or are destined for the U.S. The remaining one-third of the operations take place mainly from eastern to western Canada. About 20 percent of Bison's activity cubes-out, 45 percent weighs-out, and the remainder is not affected.

Bison Transport runs mainly on I-29 from the Emerson-Pembina border to Fargo, North Dakota and mainly on I-94 from Fargo to the destinations in the Great Lake Region. However, route assignment is also done with the assistance of a computer package. Traffic running between Toronto and Winnipeg is nearly always (depending on weight of shipment) routed across U.S. Route 2. This is because it is shorter in distance, the travel time is shorter, and because the operating cost is lower than running on the TransCanada Highway. For these in-transit operations almost all trucks enter Manitoba at the Warroad-Sprague crossing.

Most of Bison's operations into the U.S. involve triangulation. A typical operation consists of: (1) Winnipeg with a load to the Midwest; (2) load pick in the Midwest for drop off in eastern Canada; (3) load pick up in eastern Canada for drop off in Winnipeg.

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. The 10 percent winter weight allowance in Minnesota is of no consequence to the company because most of the freight is (1) not destined for Minnesota; (2) destined for States that have a maximum allowable GVW of 80,000 pounds; or (3) needs to travel through States that have a maximum allowable GVW of 80,000 pounds.

In terms of split tandems, the company thinks that at the moment split tandems are not critical to its operations. However, if this type of axle configuration were allowed in Manitoba, that could increase the company's opportunities in the movement of freight from Winnipeg to the U.S.

Lift axles are not used and would not be used by the company because they add tare weight to the trucks and also because they are not considered necessary by the company.

Truck-rail Competition

Bison Transport is not involved in any rail operations. Rail is only used by the company to reposition equipment. According to the company, rail is only competitive in: (1) long-haul movements (this is because of rail rates); and (2) less time-sensitive operations.

Law Enforcement

According to Bison Transport, law enforcement in the U.S. is adequate. However, in Canada it is not uniformly applied. It seems that enforcement officials focus only on the big, well known carriers and do not pay as much attention to the smaller ones.

In terms of the relevance of I-29 and I-35 to its truck operations, Bison Transport commented that this corridor is relevant to the company. The segment of major relevance is from the Emerson-Pembina border to Fargo. This is because almost all of the destinations are in the Great Lake Region and in the southern U.S.

Finally, Bison Transport is of the opinion that in order to enhance truck operations between the U.S. and Canada, truck size and weight laws should be harmonized in the two countries.

E.4 Erb Enterprises Ltd. (Interview conducted on October 22, 1996)

Erb Enterprises specializes in truckload movements from western Canada to the central region of the U.S. The major commodities hauled include: (1) into the U.S.--bulk grain and fertilizer; and (2) into Manitoba--corn and fertilizer. There are no movements that are destined for places south of Kansas City or into Mexico. The company only operates as far as Sioux City, Iowa.

Fleet

The fleet consists of 14 tractors and 20 trailers. The types of trailers include one van, two flatbeds and 17 hoppers. The lengths of all the trailers are either 43 or 45 feet. The standard trailer width is 102 inches and the height is about 11.5 feet (hoppers). During the past yew years Erb Enterprises has shifted to lighter equipment in order to increase the amount of payload moved.

Operations and Truck Size and Weight (TS&W) Issues

Erb Enterprises moves approximately 20 shipments per day from Winnipeg. About 85 percent of the company's operations either originate or are destined for the U.S. There are no in-transit operations between Winnipeg and eastern Canada because the company does not service this region. Erb's routes of preference are I-29 and I-94. Most of Erb's operations take place across the Emerson-Pembina crossing. However, some trucks move across the Gretna-Neche crossing or the Winkler-Walhalla crossing. The selection of the crossing depends on things such as: (1) the destination of the load; (2) the origin of the load; (3) customer requests; (4) where loading took place; and (5) the time of day.

Erb operates tridems into North Dakota with typical payloads of about 57,000 pounds. However, even though the company has the option to operate these tridems on non-Interstate highways (for example on U.S. Route 81, entering North Dakota through the Gretna-Neche border crossing) at higher weights (48,000 pounds on the tridem set), it is not done because many of the customers are located on the east side of I-29. This forces the trucks to go on I-29 for a very short distance, which reduces the maximum allowable GVW to about 85,000 pounds (the allowable GVW for a tridem operating on the Interstate). The typical payload when operating a truck with a tandem trailer into North Dakota is about 48,000 pounds.

Most of the company's operations into the U.S. involve triangulation. A typical operation consists of: (1) Winnipeg to Minneapolis with oats; (2) Minneapolis to Regina with fertilizer; (3) Regina back to Winnipeg with feed wheat.

In terms of split tandems, Erb Enterprises does not operate any trucks equipped with this type of axles. However, if this axle arrangement were allowed in Manitoba, the company thinks that it would benefit from its use (100 percent of its operations weigh-out) . The only problem that the company can foresee with split tandems is that the front axle would wear too fast from turning.

Lift axles are not used and are not attractive to the company because they add tare weight to the trucks.

Truck-rail Competition

Erb Enterprises has a small intermodal operation with CN. This operation consists of the following: (1) a tractor takes an empty international container from the CN Intermodal terminal to southern Manitoba to pick up seeds; (2) the container is taken back to the CN Intermodal terminal in Winnipeg for rail movement to Montreal; (3) the container is then shipped overseas from Montreal. Currently, the company has one tractor designated to do this operation. However, in winter, there are three tractors that move these containers, for a total of six trips per day.

In terms of competitive issues, the company thinks that rail is only competitive in east-west long-haul movements. This is because of rail rates and because north-south rail service is not as good as east-west.

In terms of the relevance of I-29 and I-35 to its truck operations, Erb commented that I-29 is very relevant to the company because most of its operations are destined for cities located in the vicinity of this route. However, I-35 is not very relevant.

Finally, Erb Enterprises is of the opinion that in order to enhance truck operations between the U.S. and Canada, truck size and weight laws should be harmonized in the two countries.

E.5 Gershman Transport International (interview conducted on October 25,1996)

The corporate headquarters of Gershman Transport International is located in Winnipeg, Manitoba. There are no other terminals in Canada, only trailer drop yards and there are no terminals in the U.S.

Gershman specializes in truckload movements from Canada to the U.S. and across Canada. The major destinations in the U.S. include the Midwest and the Southeast. There are also movements to Laredo and El Paso, Texas and to Nogales, Arizona. The major commodities hauled by Gershman include paper, agricultural commodities, furniture, dry food products, chemicals, and other general freight. Specific commodities going to (1) Laredo, Texas include meat, plastic, peat moss, and paper; (2) Nogales, Arizona include paper and furniture; and (3) El Paso, Texas include furniture, seed products, paper, chemicals, and used auto parts. The main commodity moved into Canada from these three places is produce. About 10 to 15 percent of Gershman's operations are LTL.

There are no movements into Mexico because operating costs are higher due to a lot of hidden costs associated with this operation (for example trailer damage).

Fleet

The fleet consists of approximately 157 tractors and 330 trailers (all are equipped with tandem axles). The trailers are all vans (60 percent are dry and 40 percent are refrigerated). All the trailers are 53 feet in length. The standard trailer width is 102 inches and the height is 13.5 feet. About 60 percent of Gershman's activity weighs-out, while the remaining 40 percent cubes-out.

Operations and Truck Size and Weight (TS&W) Issues

At Gershman Transport, on average, a tractor with a single driver travels 144,000 miles per year. If the tractor is being operated by a double team, the mileage increases to approximately 240,000 miles per year.

About 60 percent of the company's operations either originate or are destined for the U.S. Traffic running between Winnipeg and eastern Canada is often routed across U.S. Route 2 (nearly always in winter time). This is because it is shorter in distance, the travel time is shorter, the roads are better, roads are safer in winter, and the fuel is cheaper in the U.S. Most of Gershman's in-transit operations take place across the Warroad-Sprague crossing because of shorter distance. Some trucks move across the Pembina-Emerson crossing. The selection of the crossing depends on things such as: (1) the destination of the load; (2) the origin of the load; (3) customer requests; and (4) where loading took place.

Gershman Transport does not make use of U.S. drivers or equipment in its operations because "there are many restrictions to the use of these". Most of the company's operations into the U.S. involve triangulation. However, as part of the company's operations all shipments are moved into Winnipeg before they are distributed to their final destinations in the U.S. The only time when shipments are not taken to Winnipeg before final distribution is when they are going from British Columbia, Alberta or Saskatchewan to the U.S. southeast. The reason for this is that it is more direct to go through Portal, North Dakota.

A typical triangulation operation from Winnipeg, Manitoba consists of: (1) Winnipeg with paper to Wisconsin; (2) the vehicle dead-heads to another city in Wisconsin to pick up building materials for drop off in Toronto; (3) Toronto to Winnipeg with retail merchandise.

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. The typical payload is about 45,000 pounds for operations into the U.S. and across Canada. The 10 percent winter weight allowance in Minnesota is not used by the company because most of its operations are destined for States that have a maximum allowable GVW of 80,000 pounds.

In terms of split tandems, Gershman does not and would not operate any trucks equipped with this type of axles. The reason for this is that by acquiring semitrailers equipped with split tandems, the company would become equipment specific, therefore restricting its operations and access area.

Lift axles are not used and would not be used by the company because they add tare weight to the trucks and also because there are too many operating restrictions. Another reason is that with the use of lift axles, the fleet would become specialized or equipment-specific, therefore restricting its access area.

Truck-rail Competition

Gershman Transport is not involved in any intermodal operations. Rail is only used by the company to reposition equipment. According to the company, rail is only competitive in: (1) east-west long-haul movements (this is because of rail rates); and (2) less time-sensitive operations. Rail is not competitive regarding service.

Law Enforcement

According to Gershman, law enforcement in the U.S. is not uniform due to differences in weight limits. In Canada, there are no problems with law enforcement.

In terms of the relevance of I-29 and I-35 to its truck operations, Gershman commented that the I-29 component of this corridor is of more relevance to the company than the I-35 component. This is because I-29 provides access to other major highways of interest to the company. For example I-80, I-90 and I-94.

Finally, Gershman is of the opinion that in order to enhance truck operations between the U.S. and Canada, truck size and weight laws should be enforced uniformly. In addition, Canadian carriers should also be allowed to perform point-to-point deliveries and pick ups in the U.S. in the same way as U.S. carriers (like Schneider) currently operate in Canada.

E.6 **Kleysen Transport** (interview conducted on October 17, 1996)

The corporate headquarters of Kleysen Transport is located in Winnipeg, Manitoba. There are terminals in most Canadian provinces and there is one terminal located in Chicago, Illinois.

Kleysen Transport specializes in truckload movements of paper, dry goods, chemicals, seeds, hay, and other general freight from Canada to the northeastern U.S. (Michigan, Indiana, Ohio, Illinois, Minnesota, Kentucky, Wisconsin and others). There are very few movements that are destined for places south of Kansas City. One of the reasons for this is that according to the company, the southern market is completely dominated by U.S. carriers such as Schneider and J.B. Hunt. Operations to Laredo, Texas are very minimal because operating costs are higher due to a lot of hidden costs involved with these operations. Kleysen Transport has no operations into Mexico.

Fleet

The fleet consists of between 450 and 600 tractors and 538 semitrailers. The types of semitrailers owned and operated by Kleysen Transport include dry vans, reefer vans (which account for approximately seven percent of the vans), heated vans (which account for approximately one-quarter of the vans), pneumatic tanks, end dumps, hoppers, flatbeds, and drop deck trailers. Over and above these trailers, Kleysen also operates 55 sets of B-trains, most of which are 5-axle. The type of trailers used with these B-trains include heated vans, pneumatic tanks, end dumps, hoppers, and flatbeds.

Sixty-two percent of Kleysen trailer fleet are 53-foot semitrailers, 35 percent are 48-foot, and the other three percent are other lengths, shorter than 48 feet. All new semitrailers in the past year have been 53 footers. Almost one-quarter of Kleysen trailer fleet (109 semitrailers) are tridem axle semitrailers. The standard trailer width is 102 inches.

During the past yew years Kleysen has shifted to lighter equipment. The reason for this is that certain commodities (paper, for example), have forced the company to run lighter equipment. According to Kleysen, this shift has not occurred in order to compete with U.S. carriers, since it is believed that it is U.S. carriers the ones that compete with Canadian carriers. With this new equipment, typical payloads are about 46,000 pounds with 80,000-pound GVWs.

Operations and Truck Size and Weight (TS&W) Issues

Most of the company's operations either originate or are destined for the U.S. This is because according to the company, "there is no money east-west" within Canada. All vans, flatbeds and drop decks, and very few of the dry bulk trailers operate into the U.S.

Kleysen Transport runs on I-29 from the Emerson-Pembina border to Fargo, North Dakota and mainly on I-94 from Fargo to the destinations in the northeastern U.S. Traffic running between Winnipeg and eastern Canada is often routed across U.S. Route 2. This is because it is shorter in distance, the travel time is shorter, fuel in the U.S. is cheaper, roads are better, and it is safer than driving on the TransCanada Highway. However, whether or not trucks are routed across U.S. 2 depends on the commodity being hauled and on the type of equipment being used (for example, tridem axle semitrailers are not taken into the U.S. because they are not allowed in certain States).

All the operations into the U.S. involve triangulation. A typical operation from its terminal in Winnipeg, Manitoba consists of: (1) Winnipeg with a load to northeastern U.S.; (2) load pick up in northeastern U.S. for drop off in Toronto or Montreal; (3) load pick up in Toronto or Montreal for drop off in Winnipeg. Another typical operation is: (1) Toronto or Montreal with a load to Manitoba; (2) load pick up in Manitoba for drop off in Saskatchewan; (3) load pick up in Saskatchewan for drop off in Alberta; (4) load pick up in Alberta for drop off in British Columbia; (5) load pick up in British Columbia for drop off in the northeastern U.S.; and (6) load pick up in the northeastern U.S. for drop off in Montreal or Toronto.

No U.S. drivers or U.S. equipment are employed by Kleysen in its operations. This is because according to the company, there is no need for that, since there are no point-to-point operations within the U.S., only within Canada.

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. The 10 percent winter weight allowance in Minnesota is not used by the company because it is preferable to "keep things uniform" throughout the year, that way there are no misunderstandings between the carrier and the shipper or the people loading the trucks. Another reason is that most of the operations are destined for States that have a maximum allowable GVW of 80,000 pounds.

In terms of split tandems, the company thinks that this type of axles is of no use to the company. The reason for this is that by acquiring semitrailers equipped with split tandems, the company would become equipment specific, therefore restricting its operations and access area. One of the points clearly emphasized by the company is that the equipment should always be kept as uniform and as flexible as possible. This is to facilitate operations and to have easier access to all areas in the U.S. and Canada.

Lift axles are not used and would not be used by the company because they add tare weight to the trucks and also because there is a higher maintenance cost associated with the use of this type of axles.

Kleysen Transport is not familiar with wide-based tires. However, they think that this type of tires would not be feasible for the company's operations because trucks travel long distances and these tires are difficult to replace and repair (for example, if a tire is lost in the course of a trip, the truck cannot move until the tire is repaired--that costs the company a lot of money).

Truck-rail Competition

Kleysen Transport owns a fleet of 190 containers which operate across Canada.. About 75 percent of these containers are 48 feet in length (one-third of the 75 percent are equipped with refrigerating units). The remaining 25 percent are 20-foot dump containers, used on 5-axle chassis. According to the company, rail is only competitive in: (1) east-west operations (this is because north-south rail service is very inefficient); (2) long-haul movements; and (3) less time-sensitive operations. However, the general opinion is that "rail will never touch truck because rail has its own market, and there are many people that are willing to pay for truck services".

Law Enforcement

According to Kleysen Transport, law enforcement is sporadic. Sometimes "if U.S. carriers are running empty and Canadian carriers are full, enforcement officials will pick on Canadians only".

In terms of the relevance of I-29 and I-35 to its truck operations, Kleysen commented that this corridor is of little relevance to the company because most of its operations are destined for the northeast area of the U.S., therefore, the routes of preference are I-94 and U.S. Route 2. The only segment of this corridor that would be useful to the company is the segment from the Emerson-Pembina border to Fargo.

Finally, Kleysen Transport is of the opinion that in order to enhance truck operations between the U.S. and Canada, truck size and weight laws should be enforced uniformly. In addition, Canadian carriers should also be allowed to perform point-to-point deliveries and pick ups in the U.S. in the same way as U.S. carriers (like Schneider) currently operate in Canada.

E.7 **Penner International Inc.** (Interview conducted on October 17, 1996)

The corporate headquarters of Penner International is located in Steinbach, Manitoba. There are five other terminals in Canada. These are in located in Vancouver, Edmonton, Calgary, Winnipeg, and Toronto. The only U.S. terminal is located in Minneapolis, Minnesota.

Penner specializes in U.S.-Canada truckload movements from western Canada to the U.S. Midwest and from Ontario to western Canada. The major commodities hauled include auto parts, newsprint, furniture, and other general freight. Between 10 to 15 percent of its operations are LTL. There are very few movements that are destined for places south of Kansas City, and there are no movements into Mexico. The company used to run to Oklahoma and Kansas but the revenue per mile decreased, therefore, the operation was stopped.

Fleet

The fleet consists of 200 tractors and 500 trailers. The trailers are all dry vans. One-half of these are 53-foot semitrailers, and the other half 48-foot. All new semitrailers in the past two years have been 53 footers. The standard trailer width is 102 inches and the height is 13.5 feet. About two-thirds of Penner's activity cubes-out, while the remainder weighs-out.

Penner does not operate any tridem-axle semitrailers because: (1) "most of the U.S. is restricted to 80,000 pounds"; and (2) "the extra axle decreases the miles per gallon by about 10 to 12 percent. Also the tear in the middle axle is excessive".

During the past yew years Penner has shifted to lighter equipment in order to compete with Canadian carriers. Also because certain commodities have forced the company to use this lighter equipment. With this new equipment, typical payloads are about 46,000 pounds. At 80,000 pounds GVW, this allows a tare weight of about 34,000 pounds.

Operations and Truck Size and Weight (TS&W) Issues

At Penner International, on average, a tractor with a single driver travels 120,000 miles per year. If the tractor is being operated by a double team, the mileage increases to approximately 200,000 miles per year.

Most of the company's operations either originate or are destined for the U.S. Traffic running between Winnipeg and eastern Canada is often routed across U.S. Route 2. This is because it is shorter in distance, the travel time is shorter, and the roads are better. Most of Penner's operations take place across the Warroad-Sprague crossing. However, some trucks move across the Roseau-South Junction crossing and the Pembina-Emerson crossing. The selection of the crossing depends on things such as: (1) the destination of the load; (2) the origin of the load; (3) customer requests; and (4) where loading took place. For example:

(1) if a load is going from Winnipeg to Chicago, it would cross at the Roseau-South Junction port of entry; (2) if a load is moving in transit from Ontario to Winnipeg, the Warroad-Sprague port of entry is used; and (3) if a load is moving into Manitoba and it has not been pre cleared, then it will go through the Pembina-Emerson crossing.

All the operations into the U.S. involve triangulation. A typical operation from its terminal in Winnipeg, Manitoba consists of: (1) Winnipeg with a load to Chicago; (2) load pick up in Chicago for drop off in Toronto; (3) load pick up in Toronto for drop off in Winnipeg.

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. The 10 percent winter weight allowance in Minnesota is not used by the company because of the nature of its operations (TL carrier). Another reason is that most of the operations are destined for States that have a maximum allowable GVW of 80,000 pounds.

In terms of split tandems, the company thinks that this type of axles is of no use to the company. The reason for this is that by acquiring semitrailers equipped with split tandems, the company would become equipment specific, therefore restricting its operations and access area.

Lift axles are not used and would not be used by the company because they add tare weight to the trucks and also because there is a higher maintenance cost associated with the use of this type of axles. Another reason is that with the use of lift axles, the fleet would become "specialized" or "equipment-specific", therefore restricting its access area.

Penner International is not familiar with wide-based tires. However, it is believed that this type of tires would not be feasible for the company's operations because trucks travel long distances and these tires are difficult to replace and repair (for example, if a tire is lost in the course of a trip, the truck cannot move until the tire is repaired--that costs the company a lot of money).

Truck-rail Competition

Penner International is not involved in any rail operations. According to the company, rail is only competitive in: (1) east-west long-haul movements (this is because of rail rates--for example, for a truck load to be moved from western Canada to eastern Canada, rail charges about $ 650. For the same shipment, the company would charge about $ 1,200) ; and (2) less time-sensitive operations. Rail is not competitive regarding service.

Law Enforcement

According to Penner International, law enforcement in the U.S. is adequate. However, in Manitoba, it "has gone overboard". It seems that enforcement officials are not there to assist the carriers but to fine them.

In terms of the relevance of I-29 and I-35 to its truck operations, Penner commented that this corridor is of little relevance to the company because most of its operations are destined for the northeast area of the U.S., therefore, the routes of preference are I-94 and U.S. Route 2. The only segment of this corridor that would be useful to the company is the segment from the Emerson-Pembina border to Fargo.

Finally, Penner International is of the opinion that in order to enhance truck operations between the U.S. and Canada, carriers should be "fairly compensated for the service provided". Regulations should be uniformly and fairly applied, and trucking companies should be treated with respect.

E.8 TransX

The corporate headquarters of TransX is located in Winnipeg, Manitoba. There are terminals in most Canadian provinces and there are seven terminals in the U.S. These are located in Chicago, Minneapolis, Charlotte, Houston, Miami, Laredo and Los Angeles. There is one terminal in Mexico located in Nuevo Laredo (just south of Laredo, Texas).

TransX specializes in general freight movements throughout North America with TransX, TransX USA, and TransX Mexicana S.A. de C.V. Other members of TransX are CoolX, TransX Skyway Air Freight, TX Logistics Services and TransX Oil Transportation. Approximately 35 percent of TransX's operations within Canada are LTL. However, LTL accounts for only about 10 percent of the company's operations into the U.S.

The major destinations served by TransX are: (1) for LTL shipments--Chicago, Illinois and Minneapolis, Minnesota; and (2) for TL shipments--the U.S. Midwest and east coast, California and Texas. There is a large operation into Mexico conducted by TransX Mexicana.

The major commodities moved by TransX include: (1) from Canada into the U.S.--paper (from Kenora, Ontario), meat (from Alberta to Chicago and the U.S. east coast), french fries (from Manitoba--about 30 to 40 loads per week), airplane parts, food products, Proctor and Gamble products; (2) from the U.S. into Canada--produce (some from Nogales, Arizona to western Canada), finished goods (from Chicago), books, dog food, and other general freight; (3) across Canada--food products (east to west), construction equipment, motorcycle parts, Lipton products, and Campbell products (east to west); and (4) from Canada into Mexico--frozen french fries (about 5 to 10 trips per week).

Fleet

The fleet consists of approximately 350 tractors and 1000 semitrailers. The types of semitrailers owned and operated by TransX include dry unheated vans (about 40 percent of all vans), reefer vans (which account for approximately 40 percent of the vans), heated vans (which account for approximately 20 percent of the vans), flatbeds (12 in total), and tankers (25 of the total trailers, used for oil movements).

About one-half of TransX's trailer fleet are 53-foot semitrailers, the other half are 48-foot. All new semitrailers in the past year have been 53 footers. Almost 40 percent of the company's trailer fleet are tridem axle semitrailers. These semitrailers operate to and from California, Texas, Wisconsin, and Illinois. Typical payloads on these tridems are about 56,000 pounds. The standard trailer width is 102 inches.

TransX does not run any triple trailer combinations because "triples are more effective in LTL operations than in TL". However, the company does operate rocky mountain doubles from Winnipeg to Alberta. Between 8 to 10 tractors leave the Winnipeg terminal per night. The operation takes place at night because of Manitoba regulations. The short trailer is loaded with LTL items such as cereal, carpets, and other general freight. The longer trailer is loaded with a TL commodity such as Campbell soup.

During the past yew years TransX has shifted to lighter equipment in order to compete with other carriers. Another reason is that certain commodities (paper, for example), have forced the company to run lighter equipment. Also, operating costs decrease with the use of this equipment. With this new equipment, typical payloads are about 53,000 pounds when running across Canada and 43,000 when running in the U.S.

Operations and Truck Size and Weight (TS&W) Issues

A tractor travels an average of 185,000 miles per year. TransX charges approximately $1.50 per mile to run within Canada and about US$1.20 per mile to run from Canada to the U.S. Most of the company's operations either originate or are destined for the U.S. Traffic running between Winnipeg and eastern Canada is often routed across U.S. Route 2. This is because it is shorter in distance, the travel time is shorter, fuel in the U.S. is cheaper, roads are better, and it is safer than driving on the TransCanada Highway. However, whether or not trucks are routed across U.S. Route 2 depends on the commodity being hauled, the destination of the shipment, and the weight of the load. Most of these in-transit operations take place through the Emerson-Pembina border crossing. About 20 percent of TransX's activity weighs-out, the remainder cubes-out.

Most of the operations into the U.S. involve triangulation. A typical operation from its terminal in Winnipeg, Manitoba consists of: (1) Winnipeg with frozen french fries to Laredo, Texas; (2) the vehicle dead-heads from Laredo, Texas to Nogales, Arizona on I-10; (3) Nogales, Arizona with produce into western Canada; (4) load pick up in western Canada for drop off in Winnipeg. Another typical operation is: (1) Toronto to Winnipeg with Proctor and Gamble products; (2) load pick up in Winnipeg for drop off in Chicago; (3) load pick up in Chicago for drop off in Toronto or Montreal.

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. The 10 percent winter weight allowance in Minnesota is not used by the company because it only applies for a period of approximately three months. However, this increased weight allowance provides the company with a flexibility in loading of the vehicles (decreasing the possibilities of being overweight)

TransX makes use of split tandems in its operations within the U.S. The company thinks that if this axle arrangement were allowed in Manitoba, it would benefit from its use. The reason is that by using split tandems, the payload would increase and there would be more flexibility of loading.

Lift axles are not used and would not be used by the company because they add tare weight to the trucks and also because there is a higher maintenance cost associated with the use of this type of axles.

TransX does not make use of wide-base tires. However, the company thinks that it would not benefit from the use of this type of tires because of the high cost associated with them.

Truck-rail Competition

TransX is one of Canadian National's biggest intermodal customers in Canada. The company owns a fleet of approximately 1000 containers (53 and 48-foot) which operate across Canada. The typical payload on the 53-foot containers is about 54,000 pounds. This overweighs the trucks, making it difficult for them to operate in the city of destination. However, the company "will sometimes accept overweight shipments, depending on the customer and on the destination of the shipment". Some of TransX's customers prefer to use rail because of lower rates. However, this is only done with the movement of non time-sensitive commodities. According to the company, rail is only competitive in: (1) east-west operations (this is because north-south rail service is very inefficient); (2) long-haul movements; and (3) less time-sensitive operations.

Law Enforcement

According to TransX, law enforcement in the U.S. is "very strong and fairly consistent. They seem to take law enforcement more serious". However, in Canada the enforcement of the regulations is "very inconsistent in terms of fines and hours of operation of the scales". Regulation enforcement in Canada "is not taken so seriously".

In terms of the relevance of I-29 and I-35 to its truck operations, TransX commented that this corridor is of much relevance to the company because "it is the heart of their operation".

Finally, TransX is of the opinion that in order to enhance truck operations between the U.S. and Canada, there should be "less regulation at the borders". In the opinion of the company, "random checks at the borders are a waste of time". Also, more deregulation is necessary in order to allow the trucking industry to become more competitive.

E.9 Trapper's Transport Ltd. (Interview conducted on October 17, 1996)

Trapper's Transport is located in Winnipeg, Manitoba on Dawson Road. The company offers LTL and full load service to Eastern and Western Canada and to the U.S. This is the only terminal in Canada.

The major commodities hauled by Trapper's Transport include manufactured goods, bulk seed, fish, and other general freight from Winnipeg to Minneapolis, Chicago, the Great Lake Region and other States in the northeastern U.S. Some movements are destined for the States of Washington and California. Very few movements are destined for places south of Kansas City. However, the company hauls frozen products and dry manufactured goods from Winnipeg to Laredo, Texas and McAllen, Texas. There are no movements into Mexico.

Fleet

The fleet consists of 17 tractors and 25 trailers. The trailers are mostly vans equipped with refrigerating units and 48 feet in length. The use of 53-foot trailers has not been implemented by the company because it is believed that these longer trailers are more difficult to operate in cities with high traffic volumes or infrastructural restrictions. In the opinion of the company, "53-foot trailers are not made for downtown Chicago, Minneapolis or Los Angeles--major cities cannot handle 53 footers". All trailers have tandem axles and the standard trailer width is 102 inches.

Operations and Truck Size and Weight (TS&W) Issues

Trapper's Transport moves approximately between three and four shipments per day from Winnipeg.

Approximately 85 percent of the company's operations either originate or are destined for the U.S.

Trapper's Transport runs on I-29 from the Emerson-Pembina border to Fargo, North Dakota and mainly on I-94 from Fargo to the destinations in the northeastern U.S. Almost one-third of the traffic running between Winnipeg and eastern Canada is in-transit, routed across U.S. Route 2. This is because it is shorter in distance, the travel time is shorter, and because the highways are better.

Almost one-half of the operations into the U.S. involve triangulation.

No U.S. drivers and U.S. equipment are employed by Trapper's in its operations. The company believes that "for cross border operations the only issue that matters is the commodity being hauled by the trailer".

In terms of gross vehicle weight, the company operates at a GVW of 80,000 pounds everywhere in the U.S. The 10 percent winter weight allowance in Minnesota is sometimes used.

In terms of split tandems, the company thinks that split tandems are not critical to its operations because "split tandems have no bearing on weight distribution" and the company would not make use of them even if this type of axles were allowed in Manitoba.

Lift axles are not used and would not be used by the company because "they add tare weight to the trucks and they ruin the roads--they are useless".

In terms of wide-based tires, Trapper's transport believes that there are no advantages to using this type of tires, mainly because they are more difficult to obtain and repair. However, in short-haul movements (within 200 miles from home) they could be of some benefit.

Truck-rail Competition

Trapper's Transport is not involved in any intermodal operations. According to the company, rail is only competitive in long-haul movements and less time-sensitive operations.

Law Enforcement

According to Trapper's Transport, law enforcement in the U.S. "is much better than anywhere in Canada".

In terms of the relevance of I-29 and I-35 to its truck operations, Trapper's commented that this corridor is of much relevance to the company.

Finally, Trapper's Transport is of the opinion that in order to enhance truck operations between the U.S. and Canada, a North American enforcement agency should be established to standardize truck size and weight laws in the two countries.

APPENDIX F

The Transearch Database

Table F-1

Competitive Commodity Movements between Corridor States

(commodities which move between the same state origin-destination pairs, in the same direction, in major quantities (10 or more 25-t trucks/day), by both truck and rail)

O-D Pair	Commodity	Percent by Truck	Percent by Rail
MN to IA	• food	85.3	14.7
	• petroleum and products	82.3	17.7
MN to MO	• food	46.4	53.6
IA to MN	• chemicals	30.8	69.2
	• building materials	86.1	13.9
	• food	96.2	3.8
IA to MO	• food	40.0	60.0
	• chemicals	94.9	5.1
IA to OK	• food	80.4	19.6
IA to TX	• food	27.1	72.9
MO to IA	• chemicals	45.5	54.5
MO to KS	• food	74.7	25.3
MO to OK	• food	35.3	64.7
	• building materials	75.9	24.1
MO to TX	• food	34.2	65.8
	• chemicals	80.5	19.5
	• building materials	53.3	46.7
KS to IA	• chemicals	33.3	66.7
KS to MO	• food	87.1	12.9
	• chemicals	69.4	30.6
	• coal	39.3	60.7
KS to OK	• food	60.9	39.1
	• chemicals	69.4	30.6
KS to TX	• food	24.0	76.0
	• chemicals	33.3	66.7
OK to KS	• chemicals	31.6	68.4
	• petroleum and products	50.0	50.0
OK to TX	• food	94.6	5.4
	• chemicals	20.3	79.7
	• petroleum and products	61.5	38.5
	• paper and print	29.2	70.8
TX to IA	• primary metals	29.7	70.3
TX to MO	• chemicals	26.9	73.1
	• petroleum and products	77.4	22.6
	• primary metals	52.4	47.6
TX to KS	• chemicals	30.6	69.4
TX to OK	• chemicals	69.6	30.4
	• petroleum and products -	94.7	5.3
	• building materials	67.6	32.4
	• primary metals	72.5	27.5

Source: Chapter 4--Reference 3

APPENDIX G

On-road Truck Classification Survey

On-road Truck Classification Survey

This appendix shows tables that summarize the results obtained from the three on-road classification surveys conducted on I-29 and I-35 during the course of the research.

Table G-1-a

Truck Fleet Distribution on PTH 75 in Manitoba by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck+ Trailer	B-trains	Other	Total	Percentage
Lowboy	0	0	0	0	0	1	0	0	0	0	0	1	1%
Platform (other than lowboy)	0	0	16	0	0	5	0	0	1	0	0	22	23%
Livestock	0	0	2	0	0	0	0	0	0	0	0	2	2%
Insulated Refrg Van	0	0	2	0	0	0	0	0	0	0	0	2	2%
Drop Frame Van	0	0	0	0	0	0	0	0	0	0	0	0	0%
Other Vans	5	0	25	0	1	0	0	1	0	0	0	32	33%
Beverage	0	0	0	0	0	0	0	0	0	0	0	0	0%
Auto Transport	0	0	0	0	0	0	0	0	0	0	0	0	0%
Grain Bodies (hopper)	1	0	9	0	0	1	0	0	0	6	0	17	18%
Gravel Bodies (hopper)	0	0	5	0	0	3	0	0	0	0	0	8	8%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	2	0	3	0	0	1	0	0	0	0	0	6	6%
JM Box	0	0	0	0	0	0	0	0	0	0	0	0	0%
Tank Truck, Liquids or Gas	1	0	2	0	0	0	0	0	0	0	0	3	3%
Tank Truck Dry Bulk	0	0	2	0	0	0	0	0	0	0	0	2	2%
Concrete Mixer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Containers	0	0	0	0	0	0	0	0	0	0	0	0	0%
Domestic Containers	0	0	0	0	0	0	0	0	0	0	0	0	0%
Tractor	0	0	0	0	0	0	0	0	0	0	0	0	0%
Other	0	0	1	0	0	1	0	0	0	0	0	2	2%
Total	9	0	67	0	1	12	0	1	1	6	0	97	100%
Percentage	9%	0%	69%	0%	1%	12%	0%	1%	1%	6%	0%	100%	

Source: JM Truck Classification Survey: August, 1996

Table G-1-b

Truck Fleet Distribution on I-29 in North Dakota by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck+ Trailer	B-trains	Other	Total	Percentage
Lowboy	0	0	3	9	0	2	0	0	0	0	0	14	4%
Platform (other than lowboy)	1	0	22	0	1	8	0	0	0	0	0	32	10%
Livestock	0	0	15	0	0	0	0	0	0	0	0	15	4%
Insulated Refrg Van	0	0	26	1	0	0	0	0	0	0	0	27	8%
Drop Frame Van	0	0	3	0	0	0	0	0	0	0	0	3	1%
Other Vans	17	1	81	0	8	1	0	6	0	0	1	115	34%
Beverage	1	0	0	0	1	0	0	0	0	0	0	2	1%
Auto Transport	0	0	1	0	0	0	0	0	0	0	0	1	0%
Grain Bodies (hopper)	0	0	62	0	0	1	0	0	0	2	1	66	20%
Gravel Bodies (hopper)	0	0	2	0	0	5	0	0	0	0	0	7	2%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	9	1	1	0	0	1	3	0	0	0	0	15	4%
JM Box	0	0	1	0	0	0	0	0	0	0	0	1	0%
Tank Truck, Liquids or Gas	0	0	14	0	0	0	0	0	0	0	1	15	4%
Tank Truck Dry Bulk	0	0	7	0	0	0	0	0	0	1	1	9	3%
Concrete Mixer	2	0	0	0	0	1	1	0	0	0	0	4	1%
Containers	0	0	1	0	0	0	0	0	0	0	0	1	0%
Domestic Containers	0	0	0	0	0	0	0	0	0	0	0	0	0%
Tractor	3	0	0	0	0	0	0	0	0	0	0	3	1%
Other	3	1	0	0	0	2	0	0	0	0	0	6	2%
													0%
Total	36	3	239	10	10	21	4	6	0	3	4	336	100%
Percentage	11%	1%	71%	3%	3%	6%	1%	2%	0%	1%	1%	100%	

Source: JM Truck Classification Survey: August, 1996

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Table G-1-c

Truck Fleet Distribution on I-29 in South Dakota by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck+ Trailer	B-trains	Other	Total	Percentage
Lowboy	0	0	0	0	0	1	0	0	0	0	1	2	<1%
Platform (other than lowboy)	3	0	44	22	0	3	0	1	1	0	1	75	13%
Livestock	0	0	28	1	0	4	0	0	0	0	0	33	6%
Insulated Refrg Van	0	0	54	3	1	0	0	0	0	0	0	58	10%
Drop Frame Van	0	0	3	0	0	0	0	0	0	0		3	1%
Other Vans	30	0	143	2	13	0	0	5	0	0	7	200	35%
Beverage	1	0	3		0	0	0	0	0	0	0	4	1%
Auto Transport	0	0	5	0	1	0	0	0	0	0		6	1%
Grain Bodies (hopper)	0	0	74	1	0	5	0	0	0	0	3	83	15%
Gravel Bodies (hopper)	0	0	5	0	0	4	0	0	0	0	2	11	2%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	8	7	3	0	0	0	0	0	1	0	0	19	3%
JM Box	0	0	0	0	0	0	0	0	0	0	0	0	0%
Tank Truck, Liquids or Gas	3	2	39	0	0	1	0	0	0	0	0	45	8%
Tank Truck Dry Bulk	0		17	0	0	1	0	0	0	0	2	20	3%
Concrete Mixer	4	3	0	0	0	0	0	0	0	0	0	7	1%
Containers	0	0	0	0	0	0	0	0	0	0	0	0	0%
Domestic Containers	0	0	0	0	0	0	0	0	0	0	0	0	0%
Tractor	3	0	0	0	0	1	0	0	0	0	0	4	1%
Other	2	0	0	0	0	0	0	0	0	0	0	2	<1%
Total	54	12	418	29	15	20	0	6	2	0	16	572	100%
Percentage	9%	2%	73%	5%	3%	3%	0%	1%	<1%	0%	3%	100%	

Source: JM Truck Classification Survey: August, 1996

Table G-1-d

Truck Fleet Distribution on I-29 in Iowa by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck+ Trailer	B-trains	Other	Total	Percentage
Lowboy	0	0	1	0	0	1	0	0	0	0	1	3	1%
Platform (other than lowboy)	1	0	24	24	0	0	0	0	0	0	2	51	14%
Livestock	0	0	10	0	0	0	0	0	0	0	0	10	3%
Insulated Refrg Van	0	0	63	0	0	0	0	0	0	0	0	63	17%
Drop Frame Van	0	0	2	0	1	0	0	0	0	0	0	3	1%
Other Vans	10	0	130	0	5	1	0	13	0	0	0	159	43%
Beverage	0	0	0	0	1	0	0	0	0	0	0	1	0%
Auto Transport	0	0	1	0	1	0	0	0	0	0	0	2	1%
Grain Bodies (hopper)	0	0	29	0	0	0	0	0	0	0	0	29	8%
Gravel Bodies (hopper)	0	0	7	0	0	0	0	0	0	0	0	7	2%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	5	3	3	0	0	0	0	0	0	0	0	11	3%
JM Box	0	0	0	0	0	0	0	0	0	0	0	0	0%
Tank Truck, Liquids or Gas	0	0	13	0	0	0	0	0	0	0	0	13	3%
Tank Truck Dry Bulk	1	0	9	1	0	0	1	0	0	0	0	12	3%
Concrete Mixer	2	0	0	0	0	0	0	0	0	0	0	2	1%
Containers	6	0	1	0	0	0	0	0	0	0	0	7	2%
Domestic Containers	0	0	1	0	0	0	0	0	0	0	0	1	<1%
Tractor	0	0	0	0	0	0	0	0	0	0	0	0	0%
Other	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	25	3	294	25	8	2	1	13	0	0	3	374	100%
Percentage	7%	1%	79%	7%	2%	1%	0%	3%	0%	0%	1%	100%	

Source: JM Truck Classification Survey: August, 1996

Table G-2
Truck Fleet Distribution on I-35 (two-way)
All Truck Configurations

Truck Configuration	Minnesota		Iowa		Missouri		Kansas		Oklahoma		Texas	
2/3-axle straight	73	9%	56	5%	30	5%	56	8%	43	4%	288	7%
4-axle straight	10	1%	6	1%	18	3%	0	0%	0	0%	0	0%
5-axle straight	4	<1%	3	<1%	1	<1%	0	0%	0	0%	0	0%
Truck+trailer @ 5-axle	1	<1%	6	1%	0	0%	0	0%	0	0%	4	<1%
Truck+trailer @ 6-axle	2	<1%	0	0%	0	0%	0	0%	0	0%	0	0%
2-S1 / 2-S2	43	5%	16	1%	12	2%	10	2%	11	1%	90	2%
3-S2	586	71%	868	81%	527	84%	533	80%	800	82%	3178	82%
3-S2 Split Tandem	41	5%	70	7%	19	3%	26	4%	56	6%	155	4%
2-S3	0	0%	0	0%	0	0%	0	0%	0	0%	9	<1%
3-S3	23	3%	5	<1%	2	<1%	5	1%	6	1%	16	<1%
3-S4	8	1%	1	<1%	0	0%	0	0%	0	0%	0	0%
2-S1-2	26	3%	24	2%	9	1%	15	2%	27	3%	80	2%
3-S1-2	0	0%	8	1%	0	0%	2	<1%	4	<1%	19	<1%
Triples	0	0%	0	0%	0	0%	2	<1%	2	<1%	0	0%
2-axle truck tractor	1	<1%	1	<1%	3	<1%	1	<1%	4	<1%	4	<1%
3-axle truck tractor	5	1%	9	1%	8	1%	5	1%	10	1%	19	<1%
Other	3	<1%	2	<1%	2	<1%	8	1%	7	1%	23	1%
TOTAL	826	100%	1075	100%	631	100%	663	100%	970	100%	3885	100%

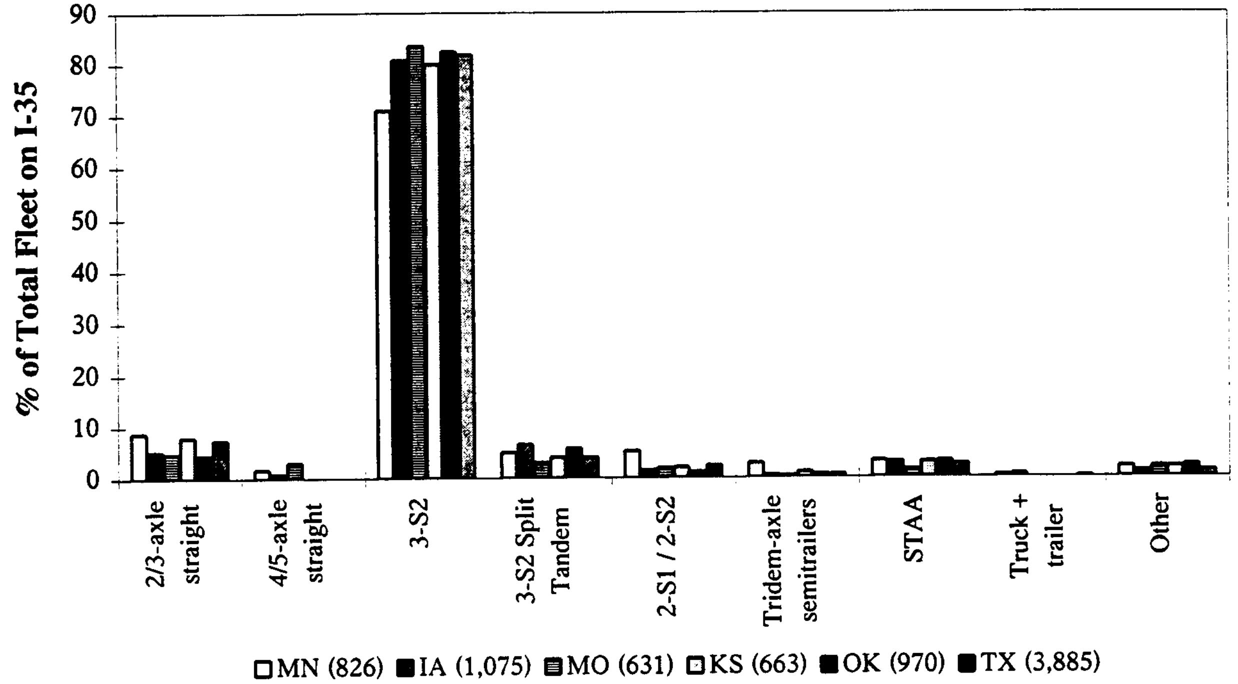
Source: JM Truck Classification Survey: May - June, 1996

Table G-3
Truck Fleet Distribution on I-35 (two-way)
All Body Types

Body Type	Minnesota		Iowa		Missouri		Kansas		Oklahoma		Texas	
Lowboy	5	1%	12	1%	6	1%	6	1%	9	1%	30	1%
Platform (other than lowboy)	100	12%	118	11%	64	10%	39	8%	159	16%	560	14%
Livestock	5	1%	19	2%	17	3%	11	2%	16	2%	40	1%
Insulated Refrigerated Van	51	6%	152	14%	64	10%	77	16%	162	17%	449	12%
Drop Frame Van	4	<1%	8	1%	1	<1%	24	5%	7	1%	43	1%
Other Vans	424	51%	576	54%	347	55%	239	50%	451	46%	2092	54%
Beverage	2	<1%	2	<1%	0	0%	6	1%	1	<1%	21	1%
Auto Transport	7	1%	6	1%	10	2%	9	2%	12	1%	28	1%
Grain Bodies (hopper)	65	8%	45	4%	35	6%	14	3%	33	3%	42	1%
Gravel Bodies (hopper)	17	2%	9	1%	0	0%	3	1%	3	<1%	46	1%
Garbage Truck	4	<1%	0	0%	0	0%	0	0%	0	0%	0	0%
Dump Truck	33	4%	25	2%	13	2%	6	1%	0	0%	83	2%
JM Box	3	<1%	8	1%	4	1%	0	0%	7	1%	98	3%
Tank Truck, Liquids or Gas	47	6%	58	5%	41	6%	25	5%	53	5%	102	3%
Tank Truck Dry Bulk	26	3%	12	1%	8	1%	4	1%	17	2%	81	2%
Concrete Mixer	0	0%	1	<1%	3	<1%	1	<1%	0	0%	19	<1%
Containers	6	1%	3	<1%	4	1%	3	1%	3	<1%	5	<1%
Domestic Containers	12	1%	8	1%	6	1%	4	1%	15	2%	65	2%
Tractor	6	1%	11	1%	7	1%	5	1%	14	1%	56	1%
Other	9	1%	2	<1%	1	<1%	0	0%	8	1%	25	1%
TOTAL	826	100%	1075	100%	631	100%	476	100%	970	100%	3885	100%

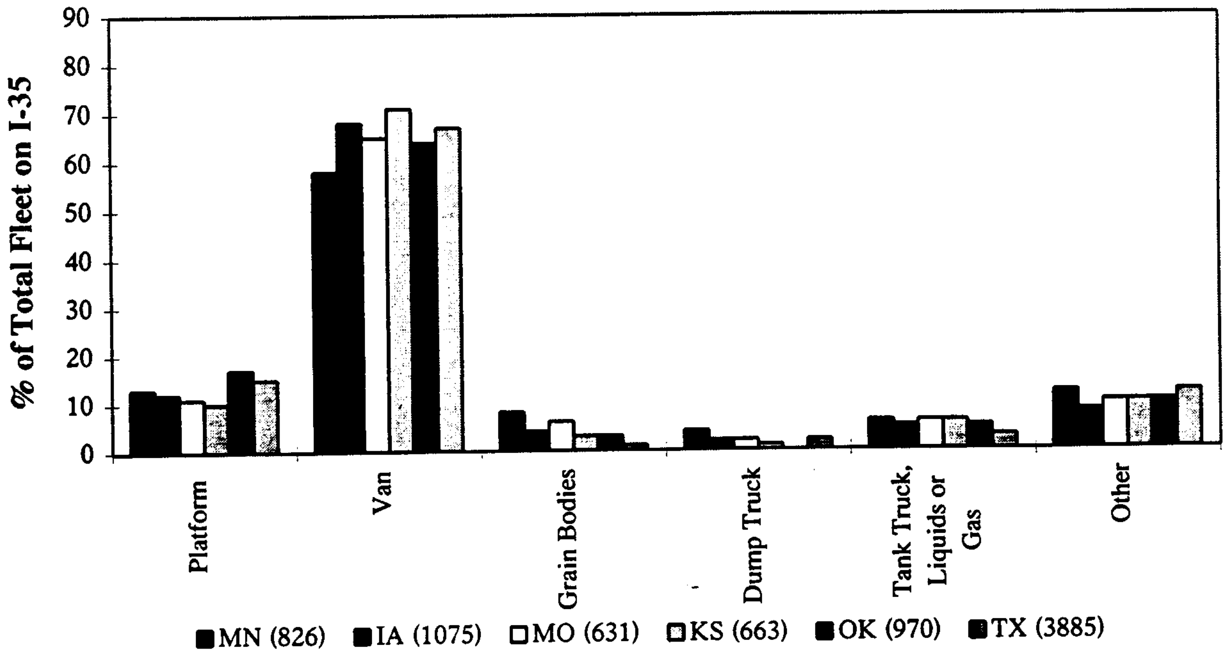
Source: JM Truck Classification Survey: May - June, 1996

Figure G-1
Fleet Mix on I-35
by Major Vehicle Configuration



Source: I-35 Corridor Study--Draft Report

Figure G-2
Fleet Mix on I-35
by Major Body Type



Source: I-35 Corridor Study--Draft Report

Table G-4-a
Truck Fleet Distribution on I-35 in Minnesota by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1/ 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck + Trailer	Other	Total	Percentage
Lowboy	0	0	2	0	0	2	0	0	0	1	5	1%
Platform (other than lowboy)	6	3	49	36	2	4	0	0	0	0	100	12%
Livestock	0	0	5	0	0	0	0	0	0	0	5	1%
Insulated Refrg Van	0	0	48	0	3	0	0	0	0	0	51	6%
Drop Frame Van	0	0	3	0	1	0	0	0	0	0	4	<1%
Other Vans	46	0	313	3	33	1	1	26	0	1	424	51%
Beverage	0	0	2	0	0	0	0	0	0	0	2	<1%
Auto Transport	0	0	7	0	0	0	0	0	0	0	7	1%
Grain Bodies (hopper)	0	0	64	0	1	0	0	0	0	0	65	8%
Gravel Bodies (hopper)	0	0	3	0	0	11	2	0	1	0	17	2%
Garbage Truck	2	2	0	0	0	0	0	0	0	0	4	<1%
Dump Truck	13	7	3	0	0	3	5	0	1	1	33	4%
JM Box	0	0	1	2	0	0	0	0	0	0	3	<1%
Tank Truck, Liquids or Gas	2	0	44	0	0	1	0	0	0	0	47	6%
Tank Truck Dry Bulk	0	0	25	0	0	0	0	0	1	0	26	3%
Concrete Mixer	0	0	4	0	0	0	0	0	0	0	4	<1%
Containers	0	0	4	0	1	0	0	0	0	0	5	1%
Domestic Containers	0	0	7	0	1	1	0	0	0	0	9	1%
Tractor	0	0	0	0	0	0	0	0	0	6	6	1%
Other	4	2	2	0	1	0	0	0	0	0	9	1%
Total	73	14	586	41	43	23	8	26	3	9	826	100%
Percentage	9%	2%	71%	5%	5%	3%	1%	3%	<1%	1%	100%	

Source: JM Truck Classification Survey: May - June, 1996

Table G-4-b
Truck Fleet Distribution on I-35 in Iowa by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1/ 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck + Trailer	Other	Total	Percentage
Lowboy	0	0	6	0	1	3	1	0	0	1	12	1%
Platform (other than lowboy)	2	1	61	53	0	1	0	0	0	0	118	11%
Livestock	0	0	18	0	1	0	0	0	0	0	19	2%
Insulated Refrg Van	1	0	140	8	1	0	0	2	0	0	152	14%
Drop Frame Van	0	0	8	0	0	0	0	0	0	0	8	1%
Other Vans	39	0	493	2	12	0	0	30	0	0	576	54%
Beverage	0	0	1	0	1	0	0	0	0	0	2	<1%
Auto Transport	0	0	6	0	0	0	0	0	0	0	6	1%
Grain Bodies (hopper)	0	0	41	4	0	0	0	0	0	0	45	4%
Gravel Bodies (hopper)	0	0	8	0	0	0	0	0	0	1	9	1%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	10	6	2	0	0	1	0	0	6	0	25	2%
JM Box	0	0	5	3	0	0	0	0	0	0	8	1%
Tank Truck, Liquids or Gas	2	0	56	0	0	0	0	0	0	0	58	5%
Tank Truck Dry Bulk	0	0	12	0	0	0	0	0	0	0	12	1%
Concrete Mixer	0	1	0	0	0	0	0	0	0	0	1	<1%
Containers	0	0	3	0	0	0	0	0	0	0	3	<1%
Domestic Containers	0	0	8	0	0	0	0	0	0	0	8	1%
Tractor	0	1	0	0	0	0	0	0	0	10	11	1%
Other	2	0	0	0	0	0	0	0	0	0	2	<1%
Total	56	9	868	70	16	5	1	32	6	12	1075	100%
Percentage	5%	1%	81%	7%	1%	<1%	<1%	3%	1%	1%	100%	

Source: JM Truck Classification Survey: May - June, 1996

Table G-4-c
Truck Fleet Distribution on I-35 in Missouri by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1/ 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck + Trailer	Other	Total	Percentage
Lowboy	0	0	4	0	0	0	0	0	0	2	6	1%
Platform (other than lowboy)	5	2	40	17	2	0	0	0	0	0	66	10%
Livestock	0	0	4	0	0	0	0	0	0	0	4	1%
Insulated Refrg Van	0	0	66	0	0	0	0	0	0	0	66	10%
Drop Frame Van	0	6	1	0	0	0	0	0	0	0	7	1%
Other Vans	18	1	307	0	10	1	0	9	0	0	346	55%
Beverage	0	0	0	0	0	0	0	0	0	0	0	0%
Auto Transport	0	0	10	0	0	0	0	0	0	0	10	2%
Grain Bodies (hopper)	0	0	36	0	0	0	0	0	0	0	36	6%
Gravel Bodies (hopper)	0	0	0	0	0	0	0	0	0	0	0	0%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	4	6	2	0	0	1	0	0	0	0	13	2%
JM Box	0	0	3	1	0	0	0	0	0	0	4	1%
Tank Truck, Liquids or Gas	0	0	41	0	0	0	0	0	0	0	41	6%
Tank Truck Dry Bulk	0	0	7	1	0	0	0	0	0	0	8	1%
Concrete Mixer	2	1	0	0	0	0	0	0	0	0	3	<1%
Containers	0	0	4	0	0	0	0	0	0	0	4	1%
Domestic Containers	0	0	3	0	0	0	0	0	0	0	3	<1%
Tractor	0	0	0	0	0	0	0	0	0	10	10	2%
Other	1	3	0	0	0	0	0	0	0	0	4	1%
Total	30	19	528	19	12	2	0	9	0	12	631	100%
Percentage	5%	3%	84%	3%	2%	<1%	0%	1%	0%	2%	100%	

Source: JM Truck Classification Survey: May - June, 1996

Table G-4-d
Truck Fleet Distribution on I-35 in Kansas by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1/ 2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck + Trailer	Other	Total	Percentage
Lowboy	0	0	3	2	0	1	0	0	0	0	6	1%
Platform (other than lowboy)	1	0	27	22	2	1	0	0	0	0	53	8%
Livestock	0	0	14	0	0	0	0	0	0	0	14	2%
Insulated Refrg Van	0	0	118	1	0	0	0	0	0	0	119	18%
Drop Frame Van	0	0	23	0	0	0	0	1	0	0	24	4%
Other Vans	47	0	256	1	5	2	0	16	0	6	333	50%
Beverage	0	0	1	0	3	0	0	0	0	3	7	1%
Auto Transport	0	0	15	0	0	0	0	0	0	0	15	2%
Grain Bodies (hopper)	0	0	16	0	0	0	0	0	0	0	16	2%
Gravel Bodies (hopper)	0	0	2	0	0	0	0	0	0	0	2	<1%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	5	0	2	0	0	1	0	0	0	0	8	1%
JM Box	0	0	0	0	0	0	0	0	0	0	0	0%
Tank Truck, Liquids or Gas	0	0	38	0	0	0	0	0	0	0	38	6%
Tank Truck Dry Bulk	0	0	3	0	0	0	0	0	0	0	3	<1%
Concrete Mixer	3	0	0	0	0	0	0	0	0	0	3	<1%
Containers	0	0	7	0	0	0	0	0	0	0	7	1%
Domestic Containers	0	0	8	0	0	0	0	0	0	1	9	1%
Tractor	0	0	0	0	0	0	0	0	0	6	6	1%
Other	0	0	0	0	0	0	0	0	0	0	0	0%
Total	56	0	533	26	10	5	0	17	0	16	663	100%
Percentage	8%	0%	80%	4%	2%	1%	0%	3%	0%	2%	100%	

Source: JM Truck Classification Survey: May - June, 1996

Table G-4-e

Truck Fleet Distribution on I-35 in Oklahoma by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1/2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck + Trailer	Other	Total	Percentage
Lowboy	0	0	4	2	0	1	0	0	0	2	9	1%
Platform (other than lowboy)	6	0	80	52	0	3	0	0	0	1	142	15%
Livestock	0	0	16	0	0	0	0	0	0	0	16	2%
Insulated Refrg Van	0	0	161	0	1	0	0	0	0	0	162	17%
Drop Frame Van	0	0	7	0	0	0	0	0	0	0	7	1%
Other Vans	35	0	385	1	10	2	0	31	0	3	467	48%
Beverage	0	0	1	0	0	0	0	0	0	0	1	<1%
Auto Transport	0	0	12	0	0	0	0	0	0	0	12	1%
Grain Bodies (hopper)	0	0	34	0	0	0	0	0	0	0	34	4%
Gravel Bodies (hopper)	0	0	3	0	0	0	0	0	0	0	3	<1%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	0	0	0	0	0	0	0	0	0	0	0	0%
JM Box	0	0	7	0	0	0	0	0	0	0	7	1%
Tank Truck, Liquids or Gas	0	0	55	0	0	0	0	0	0	0	55	6%
Tank Truck Dry Bulk	0	0	17	0	0	0	0	0	0	0	17	2%
Concrete Mixer	0	0	0	0	0	0	0	0	0	0	0	0%
Containers	0	0	1	0	0	0	0	0	0	0	1	<1%
Domestic Containers	0	0	14	1	0	0	0	0	0	0	15	2%
Tractor	0	0	0	0	0	0	0	0	0	14	14	1%
Other	2	0	3	0	0	0	0	0	0	3	8	1%
Total	43	0	800	56	11	6	0	31	0	23	970	100%
Percentage	4%	0%	82%	6%	1%	1%	0%	3%	0%	2%	100%	

Source: JM Truck Classification Survey: May - June, 1996

Table G-4-f

Truck Fleet Distribution on I-35 in Texas by Body Type

Body Type	2/3-axle Straight	4/5-axle Straight	3-S2	3-S2 Split Tandem	2-S1/2-S2	Tridem-axle semitrailers	3-S4	2/3-S1-2	Truck + Trailer	Other	Total	Percentage
Lowboy	0	0	18	4	0	2	0	0	0	6	30	1%
Platform (other than lowboy)	14	0	341	133	7	4	0	0	1	5	505	13%
Livestock	0	0	39	0	0	1	0	0	0	0	40	1%
Insulated Refrg Van	0	0	454	7	1	0	0	0	0	2	464	12%
Drop Frame Van	0	0	40	1	2	0	0	0	0	0	43	1%
Other Vans	159	0	1772	6	69	1	0	98	0	5	2110	54%
Beverage	1	0	13	0	7	0	0	0	0	0	21	1%
Auto Transport	0	0	28	0	0	0	0	0	0	0	28	1%
Grain Bodies (hopper)	0	0	40	1	0	1	0	0	0	0	42	1%
Gravel Bodies (hopper)	0	0	45	0	0	0	0	0	0	1	46	1%
Garbage Truck	0	0	0	0	0	0	0	0	0	0	0	0%
Dump Truck	50	0	33	0	0	1	0	1	3	0	88	2%
JM Box	0	0	101	2	0	0	0	0	0	0	103	3%
Tank Truck, Liquids or Gas	6	0	109	0	0	0	0	0	0	0	115	3%
Tank Truck Dry Bulk	0	0	80	1	0	0	0	0	0	0	81	2%
Concrete Mixer	19	0	0	0	0	0	0	0	0	0	19	<1%
Containers	0	0	4	0	0	0	0	0	0	0	4	<1%
Domestic Containers	0	0	61	0	1	3	0	0	0	0	65	2%
Tractor	33	0	0	0	0	0	0	0	0	23	56	1%
Other	6	0	0	0	3	12	0	0	0	4	25	1%
Total	288	0	3178	155	90	25	0	99	4	46	3885	100%
Percentage	7%	0%	82%	4%	2%	1%	0%	3%	<1%	1%	100%	

Source: JM Truck Classification Survey: May - June, 1996

Table G-5
Truck Fleet Distribution on Interstate System Highways Other Than I-35 by Truck Configuration

Truck Configuration	Minnesota I-90 approx 234 miles		Iowa I-80 approx 72 miles		Missouri I-70 approx 140 miles		Kansas I-70 approx 58 miles		Oklahoma I-40 approx 104 miles		Oklahoma I-44 approx 89 miles		Texas I-10 approx 58 miles		Texas I-20 approx 86 miles	
2/3-axle straight	23	5%	23	6%	29	5%	4	5%	28	8%	31	9%	29	16%	34	11%
4-axle straight	3	1%	4	1%	1	<1%	0	0%	2	1%	0	0%	0	0%	0	0%
5-axle straight	2	<1%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Truck+trailer @ 5-axle	12	3%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	2	1%
Truck+trailer @ 6-axle	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2-S1 / 2-S2	9	2%	2	0%	2	<1%	0	0%	4	1%	1	<1%	4	2%	5	2%
3-S2	312	73%	340	82%	470	83%	61	84%	270	80%	262	80%	132	74%	216	72%
3-S2 Split Tandem	39	9%	26	6%	34	6%	3	4%	13	4%	21	6%	10	6%	13	4%
2-S3	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
3-S3	20	5%	0	0%	1	<1%	0	0%	4	1%	1	<1%	2	1%	5	2%
3-S4	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2-S1-2	1	<1%	16	4%	22	4%	4	5%	11	3%	5	2%	1	1%	15	5%
3-S1-2	3	1%	2	<1%	1	0%	1	1%	1	<1%	1	0%	0	0%	7	2%
Triples	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2-axle truck tractor	0	0%	0	0%	0	0%	0	0%	0	0%	1	<1%	0	0%	0	0%
3-axle truck tractor	2	<1%	2	<1%	9	2%	0	0%	2	1%	4	1%	0	0%	3	1%
Other	1	<1%	1	<1%	0	0%	0	0%	3	1%	2	1%	1	1%	1	<1%
TOTAL	427	100%	416	100%	569	100%	73	100%	338	100%	329	100%	179	100%	301	100%

Source: JM Truck Classification Survey: May - June, 1996

Table G-6
Truck Fleet Distribution on Interstate System Highways Other Than I-35 All Body Types

Body Type	Minnesota I-90 approx 234 miles		Iowa I-80 approx 72 miles		Missouri I-70 approx 140 miles		Kansas I-70 approx 58 miles		Oklahoma I-40 approx 104 miles		Oklahoma I-44 approx 89 miles		Texas I-10 approx 58 miles		Texas I-20 approx 86 miles	
Lowboy	2	<1%	5	1%	5	1%	0	0%	8	2%	1	<1%	2	1%	6	2%
Platform (other than lowboy)	64	15%	52	13%	37	7%	10	14%	43	13%	47	14%	25	14%	44	15%
Livestock	10	2%	1	<1%	1	<1%	0	0%	12	4%	1	<1%	0	0%	0	0%
Insulated Refrigerated Van	72	17%	43	10%	200	35%	20	27%	56	17%	59	18%	27	15%	24	8%
Drop Frame Van	0	0%	6	1%	13	2%	2	3%	8	2%	3	1%	2	1%	3	1%
Other Vans	178	42%	256	62%	277	49%	34	47%	160	47%	153	47%	73	41%	117	39%
Beverage	1	<1%	3	1%	0	0%	0	0%	0	0%	2	1%	1	1%	0	0%
Auto Transport	0	0%	2	<1%	5	1%	1	1%	5	1%	7	2%	5	3%	5	2%
Grain Bodies (hopper)	51	12%	9	2%	1	<1%	0	0%	6	2%	13	4%	1	1%	3	1%
Gravel Bodies (hopper)	7	2%	0	0%	0	0%	0	0%	2	1%	1	<1%	2	1%	3	1%
Garbage Truck	2	<1%	0	0%	0	0%	0	0%	0	0%	0	0%	6	3%	1	0%
Dump Truck	3	1%	9	2%	0	0%	0	0%	8	2%	7	2%	5	3%	14	5%
JM Box	0	0%	1	<1%	0	0%	0	0%	6	2%	0	0%	2	1%	38	13%
Tank Truck, Liquids or Gas	24	6%	14	3%	14	2%	6	8%	15	4%	27	8%	12	7%	15	5%
Tank Truck Dry Bulk	7	2%	4	1%	0	0%	0	0%	2	1%	2	1%	6	3%	5	2%
Concrete Mixer	0	0%	3	1%	0	0%	0	0%	0	0%	0	0%	0	0%	8	3%
Containers	1	<1%	3	1%	0	0%	0	0%	0	0%	0	0%	1	1%	0	0%
Domestic Containers	0	0%	3	1%	7	1%	0	0%	0	0%	0	0%	0	0%	5	2%
Tractor	2	<1%	2	<1%	9	2%	0	0%	2	1%	5	2%	8	4%	3	1%
Other	3	1%	0	0%	0	0%	0	0%	5	1%	1	<1%	1	1%	7	2%
TOTAL	427	100%	416	100%	569	100%	73	100%	338	100%	329	100%	179	100%	301	100%

Source: JM Truck Classification Survey: May - June, 1996

APPENDIX H

Highway Crossings on the Borders

H.1 Manitoba-U.S. Border Crossings

Table A-1 shows the 1995 northbound and southbound daily trucking movements across each of the ports of entry of this border.

Table H-1
1995 Truck Crossings of the Manitoba-U.S. Border
(Average Daily Number of Trucks)

State-Province	Northbound	Southbound	Total
NORTH DAKOTA-MANITOBA			
Antler-Lyleton	3	3	6
West Hope-Coulter	10	12	22
Carbury-Goodlands	5	7	12
Dunseith-Peace Garden	41	42	83
St. John-Lena-Killarney	2	2	4
Hansboro-Cartwright	3	3	6
Sarles-Crystal City	1	2	3
Hannah-Snowflake	2	1	3
Maida-Windygates	2	3	5
Walhalla-Winkler	21	22	43
Neche-Gretna	13	24	37
Pembina-Emerson	366	373	739
Total	**469**	**493**	**962**
MINNESOTA-MANITOBA			
Noyes-Emerson East	2	2	4
Lancaster-Tolstoi	20	18	38
Pinecreek-Piney	1	1	2
Roseau-South Junction	9	18	27
Warroad-Sprague	45	53	98
Total	**78**	**92**	**170**

Source: U.S. Customs and Statistics Canada
Notes:
U.S. Customs data is for Fiscal Year 1995 (from October 1, 1994 to September 30, 1995)
Statistics Canada data is for Calendar Year 1995 (from January to December 1995)

Other important crossings at this border are discussed below.

H.1.1 Warroad-Sprague

The Warroad-Sprague border crossing is located on U.S. highway 313 on the Minnesota side and on PTH 12 on the Manitoba side. This crossing is a full commercial port which operates 24 hours per day.

This is the second highest volume crossing on the Manitoba-U.S. border, with a two-way truck traffic of 98 trucks per day in 1995. This is 10 percent more than in 1994 and 11 percent more than in 1992. Being a short-cut for Canadian east-west traffic, much of the truck movement (48 trucks per day in both directions) is in-transit between eastern and western Canada. These trucks carry mainly bulk commodities like fuel, agricultural products, grain, mustard seed and hay. [Chapter 2--Ref. 12]. There is considerable in-transit rail traffic via CN between Ontario and Manitoba (9 trains per day or 15,000 cars per month). [Chapter 2--Ref. 1, p B-13].

H.1.2 Dunseith-Peace Garden

The Dunseith-Peace Garden border crossing is located on U.S. highway 281, 13 miles north of Dunseith, North Dakota. It is located approximately 65 miles south of Brandon, Manitoba on Provincial highway 10.

This is the third highest volume crossing on the Manitoba-U.S. border with a two-way truck traffic averaging 83 trucks per day in 1995. This is 12 percent less than the 1994 truck volume. This crossing handles a mixture of local, tourist and commercial activity. Commercial southbound activity includes potash, fertilizer, peat moss (from Winnipeg to California), grain, wood, paper, livestock (from Alberta, Saskatchewan and Manitoba to South Dakota, Nebraska and Iowa), diesel fuel, and machinery. [Chapter 2--Ref. 12]. Approximately one percent of the southbound trucks are empty. Northbound trucks hauling produce, equipped with refrigerating units, return with peat moss. Five percent of traffic moves in-bond to Blaine in the west and Windsor in the east. [Chapter 2--Ref. 1, p B-10].

Principal carriers operating through this crossing include Paul's Hauling, Arnold Brothers, TransX, Murphy, Williams, Corchorane, D&D, Styles & Kelly, and Quintain.

H.1.3 Walhalla-Winkler

The Walhalla-Winkler crossing is located 86 miles south of Winnipeg and 22 miles east of Neche on U.S. highway 32 in North Dakota and Provincial highway 32. Both highways are two-lane paved roads with spring restrictions.

This is the fourth highest volume crossing on the Manitoba-U.S. border averaging a two-way truck flow of 43 trucks per day in 1995. This is almost one-third less than in 1992 and more than 100 percent less than in 1994. Northbound commercial commodities moved include soya beans, which are trucked to Winkler, Manitoba. The trucks usually return empty. For southbound movements, the crossing serves primarily local activity. From interviews with scale officers, it was learned that some of the trucks going through this crossing are attempting to avoid weigh scales.

H.1.4 Lancaster-Tolstoi

The Lancaster-Tolstoi border crossing is located 20 miles east of Noyes, Minnesota on U.S. and Provincial highway 59. This crossing averaged a two-way truck volume of 38 trucks per day in 1995, making it the fifth highest volume crossing on the Manitoba-U.S. border.

H.1.5 Neche-Gretna

This crossing is located 20 miles east of Pembina, North Dakota on U.S. highway 18 and approximately 70 miles south of Winnipeg via Provincial highways 30, 14 and 75, on PTH 30.

This is a local port with decreasing commercial activity. In 1995, two-way truck traffic averaged 37 trucks per day. This is almost one-half less than the truck traffic in 1994. Southbound commodities moved through this crossing include fuel and canola. Northbound commodities include seed grains, which are trucked to Canamera Seeds in Altona, Manitoba.

Being on U.S. 18, this crossing is subject to 105,500 pounds GVW and an overall tractor-semitrailer length of 75 feet and a tractor-double trailer combination length of also 75 feet.

H.1.6 Roseau-South Junction

The Roseau-South Junction border crossing is located 10 miles north of Roseau, Minnesota on State Highway 310, which connects to State Highway 89 to the south and Provincial Highway 12 to the north.

Roseau is a full commercial port operating 16 hours a day from 8:00 am to midnight. This crossing currently gets commercial traffic diverted from the Pembina-Emerson border crossing. In 1995, two-way commercial vehicle traffic averaged 27 trucks per day. This is one-third lower than the 1994 truck volume and 42 percent higher than in 1992. Most of the truck traffic hauls bulk commodities like lumber, gas, hay, agricultural seeds, chemicals, potash, and cement. There are also movements of plastics, paint, and farm equipment. There is also some LTL traffic, usually two trucks per night, six nights per week. [Chapter 2--Ref. 12].

H.1.7 Westhope-Coulter

The Westhope-Coulter crossing is located approximately 25 miles east of the provincial boundary line between Saskatchewan and Manitoba. It is on U.S. highway 83, 12 miles north of Westhope, North Dakota and 63 miles south of Virden, Manitoba. U.S. highway 83 is a paved two-lane road with no restrictions. It reaches south to the U.S.-Mexico border at Laredo, Texas.

Between 1992 and 1994, truck traffic at this crossing almost doubled, from 16 trucks per day to 32 trucks per day in both directions. However, in 1995, this traffic dropped by 45 percent, from 32 trucks per day to 22 trucks per day in both directions. Most of the activity at this crossing is local--mainly shopping and tourism. Almost all the commercial activity involves the hauling of potash and farm products.

This crossing is very important to the Provinces of Saskatchewan and Manitoba, as well as to the State of North Dakota. A local organization called *The U.S. Highway 83 Corridor Group* out of Minot, North Dakota, as well as the Province of Saskatchewan, are encouraging the development of north-south flow on U.S. 83 between Westhope and Laredo. This would encourage agricultural trade between Manitoba/Saskatchewan and the U.S. and Mexico.

Truck characteristics at this crossing are primarily controlled by the U.S. Federal Law, U.S. regulations, and in particular those of North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and Texas. For example, a regular 5-axle tractor semitrailer traveling from Manitoba to Mexico on this highway, is restricted to a GVW of 84,000 pounds. This is because on non-IS highways, Texas allows 84,000 pounds subject to permit. All other States in this U.S. 83 corridor allow more than 84,000 pounds on NN highways, but being the destination in Mexico, Canadian drivers have to comply with Texas regulations.

H.1.8 Other Crossings

The Manitoba-North Dakota crossings of: (1) Antler-Lyleton; (2) Carbury-Goodlands; (3) St. John-Lena; (4) Hansboro-Cartwright; (5) Sarles-Crystal City; (6) Hannah-Snowflake; and (7) Maida-Windygates; and the Manitoba-Minnesota crossing of Pinecreek-Piney, are minor very low volume crossings. The 8 crossings combined account for a two-way commercial truck traffic of 45 trucks per day. This is almost 4 percent of the total truck crossings on the Manitoba-U.S. border. Truck volumes at 7 of the 8 crossings decreased between 1994 and 1995.

Major commodity movements at these crossings are: [Chapter 2--Ref. 12]

- Antler-Lyleton: farm products such as sunflower seeds and rye
- Carbury-Goodlands: mainly potash
- St. John-Lena: pregnant mare urine, animal feed, grain and flax

- Hansboro-Cartwright: primarily farm machinery and fertilizer
- Sarles-Crystal City: primarily agricultural equipment and farm products
- Hannah-Snowflake: mainly agricultural equipment
- Maida-Windygate: majority of activity is duty-free agricultural equipment
- Pinecreek-Piney: fuel oil, hay, peat moss, lumber, potash, fertilizer and agricultural machinery

H.2 Texas-Mexico Border Crossings

The following sections discuss specific aspects of the El Paso-Ciudad Juarez and the Brownsville-Matamoros ports of entry in Texas.

H.2.1 El Paso - Ciudad Juarez

There are four border crossing facilities at El Paso: (1) Paso del Norte - non-commercial activity, (2) Good Neighbor Bridge - non-commercial activity, (3) Bridge of the Americas or Córdova Bridge - commercial and non-commercial activity, and (4) Zaragoza Bridge at Ysleta - commercial and non-commercial activity. The discussion under this section refers to El Paso as the combination of the Bridge of the Americas or Córdova Bridge and the Zaragoza Bridge.

El Paso is the second highest volume crossing on the U.S.-Mexico border, averaging 2,572 trucks per day in 1995 (two-way traffic), which grew more than eight percent since 1990. Trucking movements at this crossing are concentrated on traffic moving along the west-central region of the United States and Mexico.

Most of the trucks entering Mexico at El Paso are destined for maquiladora plants located in Ciudad Juarez. The maquiladora industry plays a very important role at this crossing since there are approximately 230 maquiladora plants in Ciudad Juarez which account for one-third of total border maquiladora-related exports to the U.S. in value. Principal northbound movements are finished goods from maquiladoras. Commodities moved southbound include wood, hazardous materials, and raw materials for maquiladoras.

Union Pacific (UP), Southern Pacific (SP) and Atchison Topeka & Santa Fe (AT&SF) railroads are connected to Ferrocarriles Nacionales de Mexico (FNM) at El Paso through two different bridges. Trailers on flat cars (TOFC) and double-stack containers are moved to Mexico City primarily from shippers and international terminals on the west coast. [Chapter 2--Ref. 16, p 137].

H.2.2 Brownsville - Matamoros

There are two border crossing facilities at Brownsville: (1) the Brownsville & Matamoros (B&M) bridge, locally known as the old bridge and (2) the Gateway bridge, locally known as the new bridge.

This is the fourth highest volume crossing on the U.S.-Mexico border, averaging 1,456 trucks per day in 1995 (in both directions) for the two bridges. Commercial vehicle volume has increased by almost 50 percent at this location since 1990. Industrial activity in the vicinity of this crossing is associated with the maquiladora plants located in Matamoros, approximately 100. Most of the northbound commercial traffic across the B&M bridge is related to agricultural products and non-maquiladora related goods. Northbound traffic at the Gateway bridge is dominated by electronics, toys, wear apparel and other products from maquiladora plants. This facility also handles a significant amount of cargo which is mainly headed for the Port of Brownsville. Southbound traffic at both locations is dominated by raw materials or parts scheduled for assembly in Mexico.

Based on interviews and field observations at the crossing, it was found that trucks operating at this crossing are for the most part 5- and 6-axle tractor semi-trailers. The 6-axle trucks operating at this crossing are mostly Mexican trucks moving to and from the Port of Brownsville and other immediate ports.